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Wenshin Chen

Northumbria University, wenshin.chen@northumbria.ac.uk

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Conceptualizing Emerging Technology in Local Contexts: An Ethnographic Study of RFID in an Emirate's Farming Industry

Wenshin Chen
Newcastle Business School
Northumbria University
wenshin.chen@northumbria.ac.uk

Abstract:

Situated in an emirate's farming industry, this ethnographic study develops a framework to help bridge the existing knowledge gap about what and how local contexts interact with emerging technology, RFID in particular. Findings suggest that numerous local factors pertaining to the researched emirate's unique environmental, project, cultural, and societal/political contexts shape and/or are reshaped by RFID implementation. For example, geographic landscape demands systems modification and device adaptation; religious custom increases project difficulty, and the systems, in turn, requires changes in certain religious practice; the notion of social sustainability establishes objectives for RFID project, while the latter helps reshape social welfare systems. As these local factors have rarely been empirically examined, my framework can help contribute to future RFID implementation in different local contexts. More specifically, insights gained urge stakeholders involved to carefully manage unique factors of the emirate or similar contexts for intended RFID projects. The findings also suggest that stakeholders should be aware of RFID's reshaping effects on the local context particularly because those effects might be unexpected.

Keywords: Context, Emerging Technology, Ethnography, Farming, RFID, Emirate, UAE

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1 Introduction

Although one can trace the history of radio frequency identification (RFID) technology back to World War II (Niederman, Mathieu, Morley, & Kwon, 2007), its rapid development and widespread application commenced only after Wal-Mart announced its RFID strategy (Bevilacqua, Ciarapica, & Marchetti, 2011), and major corporations such as Ford, Target, Toyota, and governmental authority such as the US Department of Defense quickly joined this technology trend and sought new ways to renovate their business processes (Lee & Özer, 2007). Since then, firms have paid increasing attention to RFID's technical capabilities and business potential in improving operational efficiency and data-retrieval accuracy in the supply chain process (Soon & Gutiérrez 2008), automobile lifecycle management (Cao, Folan, Mascolo, & Browne, 2009), healthcare workflow issues (Janz, Pitts, & Otondo, 2005), aircraft engineering management (Ngai et al., 2007), and municipal waste control (Abdoli, 2009).

While these extensive discussions have no doubt contributed to RFID's practical implications and further research endeavors, they have tended to overlook local contexts (i.e., the interrelated conditions in which something exists or occurs in a particular place, situation, or location) and, thus, have seldom specified the national, industrial, or any specific backgrounds of their investigations. Most empirical studies that show interest in local contexts have tended to investigate the impacts of contextual factors on the RFID implementation (e.g., Barratt & Choi, 2007). Rarely do they examine how the RFID implementation may, in turn, reshape local contexts. Consequently, we know little about how organizations can better apply RFID to different local contexts (e.g., an Arab society); and its empirical implications in an emirate's farming business in particular are practically nonexistent.

RFID is particularly relevant to contextual issues and, thus, deserves research attention because: 1) adopting organizations can possibly localize ICTs (information and communication technologies) in general, 2) RFID has much potential in non-Western societies, and 3) it drives the notion and practice of the Internet of things (IoT). First, the IT literature seems to increasingly recognize that some local cultures tend to indigenize (or localize) ICTs more than others and, in turn, shape and reshape ICTs to suit their specific preferences (Walsham 2002). Thus, one can argue that, as a rapidly growing ICT, RFID situated in a specific local context can also face similar localization processes. Second, as I detail in Section 4, most existing RFID studies are situated in Western or advanced countries. Their applications tend to focus on the current understanding derived from Western business models or IT practice. As such, RFID has a promising future in non-Western societies, particularly in developing or underdeveloped contexts whose business worlds RFID has not yet permeated.

Third, perhaps most importantly, RFID is a major driving force for the emerging notion and IT practice called the Internet of things that can potentially connect all objects, not just humans, via the Internet (Kortuem, Kawsar, Fitton, & Sundramoorthy, 2010). Such an evolutionary practice would mean "the ability of almost anything to communicate with any other thing via the Internet" (Edwards, 2012, p. 34). Given its great capability, IoT could lead to smart environments (e.g., smart home, offices) and other futuristic applications that can shape a novel paradigm that integrates "things-oriented", "Internet-oriented", and "semantics-oriented" visions of IT practice (Atzori, Iera, & Morabito, 2010). Unlike other specific software or ICT such as geographic information systems (GIS) implemented in a specific context (Walsham and Sahay 1999), IoT will connect all smart objects, mostly enabled or inspired by RFID systems (Kortuem et al., 2010; Welbourne et al., 2009), from anywhere. They could include all types of "things" across different settings and time zones. As such, one needs to consider the technical compatibility of stakeholders (human agents) from different environments. In other words, RFID and IoT are mobile and portable in nature; thus, users rarely use them in one specific setting (i.e., an organization or a country). Instead, they exist in cross contextual scenarios that require greater contextual understanding.

Accordingly, if such justifications apply, we need to further our inadequate knowledge about RFID's contextual implications for several theoretical and practical reasons. Practically, the research context in an Arab country and an emirate in particular can be insightful because of their unique social, cultural, and religious environments, different technology policy and development, and rapidly emerging economic power (Aladwani, 2003; Hoskisson, Eden, Lau, & Wright, 2000). More specifically, beyond its existing influence in the oil and gas industry, the United Arab Emirates (UAE), which comprises seven emirates, has rapidly transformed itself into a financial and tourism center in the Middle East and North Africa (MENA) region (Godwin, 2006). Its gross domestic product (GDP) per capital (at purchasing power parity (PPP)) is ranked the seventh in the world, better than those of most developed nations. In 2014, its Internet usage rate reached 90 percent of the population, while its mobile phone subscription exceeded

178 percent (World Bank, 2014). Beyond its iconic construction projects such as Burj Al Arab, Palm Jumeirah, and Burj Khalifa, Dubai, the most populated emirate of the UAE, has quickly developed into a global city and one of the most connected aviation hubs (O'Connor & Fuellhart, 2012). This rapidly emerging market, along with its traditional cultural and religious backdrop, shapes an interesting business and research context. Foreign organizations that seek to collaborate with any emirate of the UAE will benefit from empirical knowledge gained from studying it. In particular, the farming and food industry is intriguing because its products are often livestock and/or perishable goods instead of lifeless materials or parts (Grunert, 2005). How the industry delivers those goods and products is a complex issue and critical concern in the global market (Otsuki, Wilson, & Sewadeh, 2001); further, we do not know whether firms can successfully employ RFID in this industry to help overcome its supply chain complexity.

We need to better theoretically understand contextual effects and their relationships with research phenomena now more than ever (Rousseau & Fried, 2001). Failing to understand contexts suggests the research community cannot capture the essence of increasingly diversified industries, organizations, and workforces (Johns, 2006). More specifically, in the RFID domain, recent studies have suggested that various environmental and organizational factors play certain roles in an organization's RFID adoption (Lin, 2009). However, most of these empirical studies fail to contextualize, let alone context theorize, research phenomena. As such, because earlier researchers have failed to understand that operating in local contexts often lead to an organization's inability to deal with technology consequences (Myers, 1994), we need more contextualizing and context theorizing research. While contextualizing refers to specifying situational or temporal constraints and conditions, context theorizing denotes developing a deeper conceptual understanding of what and how those constraints and conditions interact with research phenomena (Bamberger, 2008).

In line with context theorizing endeavors, I build a better contextualized, theoretical framework that helps explain how organizations could implement emerging technology in general and RFID in particular in an Arab country's or, more specifically, in an emirate's farming industry. Accordingly, I address the following specific research questions:

RQ1: In the researched emirate's farming industry, what contextual factors influence RFID implementation?

RQ2: In the researched emirate's farming industry, how does RFID implementation interact with local contexts?

2 Understanding Contexts

Although empirical studies have taken the term context for granted and rarely defined it, Rousseau and Fried (2001) note its Latin origins "to knit together" or "to make a connection" (p. 1). In linguistics, context means the inter-textual relations that help make sense of a word's actual meanings or passage from the text where it is situated (Michailova, 2011). In business research, researchers have referred to context as "situational opportunities and constraints" that affect organizational behavior (Johns, 2006) and "surrounding phenomena or temporal conditions" that shape or are reshaped by events occurred in them (Bamberger, 2008). Those events may often involve people, objects, and their social interpretation in the structure where they occur (Jensen, 2005).

Similarly, in the IT literature, context can mean "a frame of reference for information behavior" in relation to culture, socioeconomic conditions, and organizational and individual situations (Tabak, 2014, p. 2225). Its effects often concern "the set of factors surrounding a phenomenon that exert some direct or indirect influence on it—also characterized as explanatory factors associated with higher levels of analysis than those expressly under investigation" (Whetten, 2009). As Berthon, Pitt, Ewing, and Carr (2002) suggest, "the context concerns the who, what, and where—the phenomenological context and content of the problem" (p. 421) where structures, tasks, and IT artifacts are embedded sequentially (Benbasat & Zmud 2003). As such, one can further view context as an objectified background for studying participants' information behaviors (Talja, Keso, & Pietiläinen, 1999) and/or an interpretive foreground where meanings of information behaviors that occur in the context are considered "socially constructed" (Tabak, 2014). In other words, context possesses investigative and interpretive characteristics where the former concerns "the when, where, and from whom/what data is collected" and the latter focuses on "the when, where, and whom of data interpretation", which "acknowledges that, while data may be objective, its interpretation is contextual" (Berthon et al., 2002, p. 422).

Integrating these prior explanations, I define context as the interrelated settings or conditions in which an event or idea occurs and only in which one can fully understand the event or idea. The event or idea can concern any information behavior related to individuals, groups, organizations, industries, and/or institutions. Based on this definition, I acknowledge context as situational boundaries and temporal conditions (Johns, 2006; Bamberger, 2008) where information behaviors interact with structures, tasks, and IT artifacts (Benbasat & Zmud, 2003) and, at the same time, leave room to appreciate its objectified and interpretive properties (Berthon et al., 2002; Tabak, 2014). As "local context" is the focus of this study', I further articulate the term as follows.

Although empirical studies have rarely specified it, conventional wisdom often considers or implies the term "local" as the immediate neighborhood where an individual resides such as community, district, or city/county (e.g., as in "local government") (Beynon-Davies & Williams, 2003). In this study, while the term local embraces the conventional norm, it also focuses on the immediate environment in which one implements IT. In other words, the situational boundaries here are primarily based on where IT is used and, thus, can be more flexible than traditionally defined. This broader definition separates local from "regional" and "global" contexts (see Figure 1) and considers five layers of situational boundaries that can all possibly constitute local contexts. While global refers to the world as a whole, regional in this paper denotes three spatial possibilities: 1) continental regions such as Europe or Asia; 2) cross-continental regions (e.g., MENA or the Asia-Pacific, which include several countries across different continents); or 3) multinational regions such as the European Union (EU) and Central or Eastern Europe that comprise multiple nations in one continent (Leydesdorff, Cooke, & Olazaran, 2002).

By contrast, local suggests a significantly smaller scale of geographic or political area that, as Figure 1 shows, includes five possible levels: 1) national; 2) country-regional (in which a group of states, provinces, or counties congregate for political or geographic purposes, such as South Italy (for the First-Level Nomenclature of Territorial Units of the EU) or Midwest in the United States (US)); 3) statewide/provincial such as South Australia in Australia or Alberta in Canada; 4) municipal, which specifically relates to a county, city, or metropolitan area such as Tyne and Wear (as a metropolitan county in England) or Newcastle upon Tyne (as a city in the United Kingdom (UK)); and 5) communal, which pertains to a community, neighborhood, district, or residential area such as Wan Chai in Hong Kong or Hell's Kitchen in New York City.

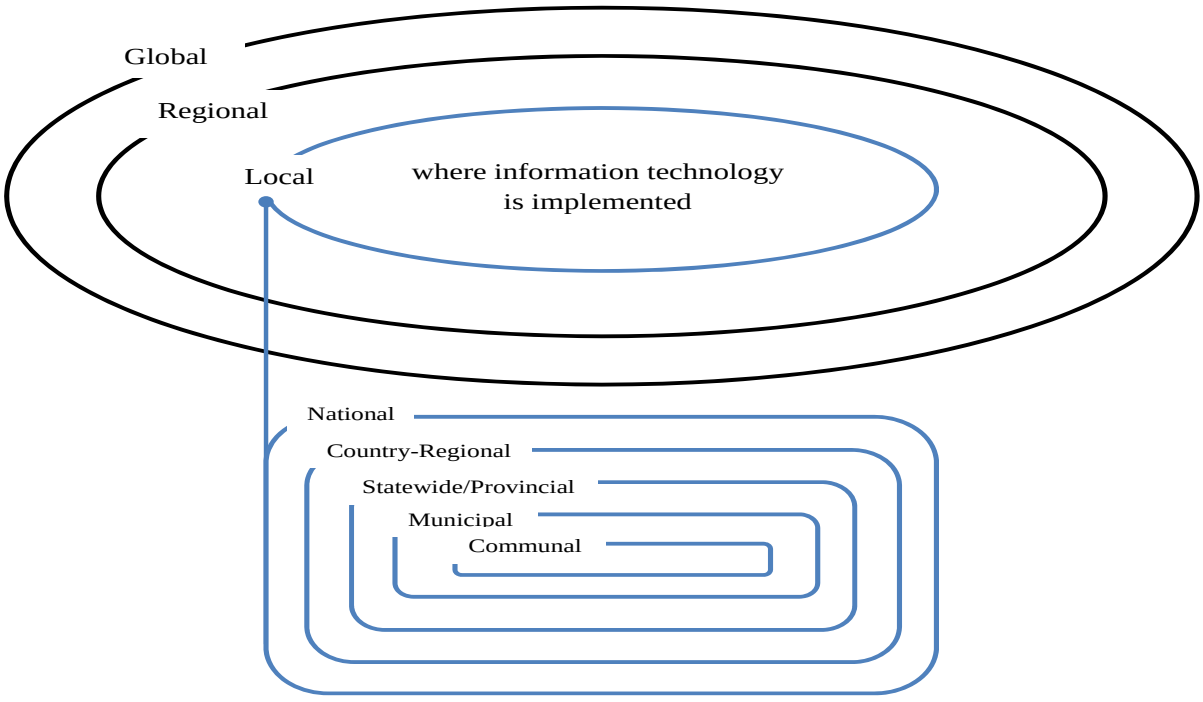

Figure 1. The Local Context (in Relation to the IT Implementation)

I broaden the definition of "local" context because I argue that the traditional, taken-for-granted use of the term should not constrain its meaning (e.g., Beynon-Davies & Williams, 2003) but should reflect the context in which IT operates. In this view, local context's meaning becomes more relative (compared to

global or regional). For example, when a multinational corporation, incorporated in San Francisco with its regional headquarter in Hong Kong that oversees Southeast Asia, implements enterprise information systems in all of its offices in Vietnam and Thailand, one should refer to local context as the country as a whole (i.e., Vietnam and Thailand, respectively) rather than at the municipal or communal levels in a traditional sense. One can consider similar arguments for the country-regional or statewide/provincial levels if one designates an IT for those contexts. In other words, North East England is, relatively speaking, a local context to the entire EU (regional) or to the world (global) when an intended IT is, for example, implemented to improve the region's infrastructure or for governmental reasons. To help clarify, Table 1 further illustrates examples of the local context at different levels and various scenarios that involve an IT/IS implementation in those contexts.

Table 1. Definition and Examples of the Local Context at Different Levels*

Levels	Definition	Examples	Scenarios
National	When the local context is referred to as a whole country	Vietnam, Thailand	If/when a multinational corporation deploys enterprise systems for all of its offices in Vietnam and Thailand.
Country-regional	When the local context denotes certain region within a country	South Italy in Italy	If/when an intended information technology is implemented for electoral purpose across all first-level nomenclature of territorial units of the EU.
Statewide/provincial	When the local context is related to a state or a province	South Australia in Australia	If/when the Australian Government mandates RFID systems in every state's farming industry.
Municipal	When the local context concerns about a county, a city, or a metropolitan area	Tyne and Wear, Newcastle upon Tyne	If/when the UK Government adopts certain type of tablet PCs for all of its municipal officials.
Communal	When the local context focuses only on a community, a district, or a neighborhood	Wan Chai in Hong Kong	If/when a telecommunication company installs new fiber optics in every district of Hong Kong.

*Given this clarification, one can consider the researched emirate as similar to the statewide/provincial or country-regional level.

2.1 Significance of Contexts

In contemporary globalized IT environments, the significance of better understanding contexts in work practice and theorizing contexts through empirical research has gained increasing recognition (Orlikowski & Barley, 2001). As Rousseau and Fried (2001) suggest, such significance is "reinforced by the emergence of a worldwide community of organizational scholars adding ever-greater diversity in settings as well as perspectives" (p. 1). More specifically, two reasons primarily drive the need to better study contexts:

> *First, the domain of organizational research is becoming more international, giving rise to challenges in transporting social science models from one society to another. Second, the rapidly diversifying nature of work and work settings can substantially alter the underlying causal dynamics of worker-organizational relations.* (Rousseau & Fred, 2001, p. 1)

In other words, scientifically speaking, contextualization is necessary for organizational research "because it makes our models more accurate and our interpretation of results more robust" (Rousseau & Fred, 2001, p. 2).

In the IT/IS literature, Orlikowski and Barley (2001) also suggest that one cannot separate studying and understanding IT from the institutional context where various factors (e.g., regulative processes, normative systems, and cultural frameworks) interact with technical systems. Walsham (2002) further points out that, while the use of ICTs has rapidly increased interconnectedness across societies and intensively compressed the notion of time and space, "different societies will appropriate the "materials of modernity" differently depending on their specific geographies, histories, and languages" (p. 360). In other words, working with ICTs across different contexts will become problematic if we do not consider contextual differences in viewing the relevance, applicability, and value of ICTs.

Thus, Bamberger (2008) suggests that, in addition to contextualizing research phenomena, future researchers should engage in context theorizing, which further conceptualizes the relationships between research phenomena and their situational and/or temporal conditions and the process through which the relationships occur. To help articulate these context-related notions, Table 2 lists specific definitions and examples.

Table 2. Conceptual Clarification of Context-Related Notions

Notions	Definition	Examples
Context	The interrelated settings or conditions in which an event or idea occurs and only in which one can fully understand the event or idea.	Germany's retail industry as a context (Uhrich, Sandner, Resatsch, Leimeister, & Krcmar, 2008). The technology environment as a context (Fehrenbacher & Helfert, 2012).
Local context	The interrelated conditions in which something exists or occurs in a *particular* place, situation, or location.	The historical and political backdrops in India (Ravishankar, Pan, & Myers, 2013). The cultural context for ERP in China's market (Liang & Xue, 2004).
Contextualizing	Specifying situational or temporal constraints and conditions in the research phenomenon.	Situating the study in Taiwan's retail industry (Tsai, Lee, & Wu, 2010). Specifying Japan's publishing industry as the research context (Loebbecke & Huyskens, 2008).
Context theorizing	Developing a deeper conceptual understanding of what and how situational/temporal constraints and conditions interact with research phenomena.	A structurational analysis of how cultural dynamics interact with IS in different countries (Walsham, 2002). A dramaturgical analysis of how the policing context shapes and reshapes the use of cellular phones (Manning, 1996).

2.2 Empirical Examples in Disciplines

In addition to business and management, contextual significance has similarly gained increasing attention in various disciplines; examples include social, political, economic, and cultural factors in Africans' political participation (Isaksson, Kotsadam, & Nerman, 2014); social, economic, and cultural upbringings in consumer behavior research (García-Álvarez, López-Sintas, & Zerva, 2009), and project and the wider environment in engineering studies in the UK (Maffin, 1998). Similarly, in the IS literature, Ravishankar et al. (2013) suggest that historical and political contexts that form "power-related asymmetries in the relationship between the West and India" considerably influence how Indian offshoring vendors interact with their Western clients (p. 388). To ensure vendor organizations better and more effective deliver offshore services, one would need to seriously analyze India's historical and political backdrops. Furthermore, the unique social, economic, and cultural contexts in China lead enterprise resource planning (ERP) researchers to suggest that international ERP vendors who intend to compete in China's markets will need to first "localize" their existing systems to accommodate China's "culturally change-resistant context" (Liang & Xue, 2004, p. 413). In other words, widely accepted Western business models or information systems will not necessarily guarantee implementation success if one does not carefully consider various local factors (e.g., social, economic, historical, political, and cultural backdrops).

2.3 Inadequacy of Existing Frameworks

Despite increasing attention, most business disciplines still lack sufficient empirical endeavors that actually engage in contextualizing or context theorizing. One might attribute the reasons for such inadequate practice to "deliberate avoidance and careless oversight" (Whetten, 2009, p. 31). For example, in the IT literature, publications in *MIS Quarterly* and *Information Systems Research* from 1997 to 2004 show that popular IS authors seldom investigate industrial context's influence on IT projects (Chiasson & Davidson, 2005). Even when researchers "account for some contextual influences within organizations, their consideration of context typically halts at the organizational boundary" (p. 597). While theoretical endeavors might have since responded to this inadequate empirical practice and attempted to build context-specific models, their attempts resemble the notion of "clean/simple model" that Rousseau and Fried (2001) suggest and, thus, often result in simplifying the complex globalized business and IT workplaces. For example, the technology-organization-environment framework that Louis G. Tornatzky and Mitchell Fleischer created specifies only three contexts that may influence an organization's technology implementation or innovation adoption: technological, organizational, and environmental

context (Pan & Jang, 2008), and mostly hypothetic-deductive, quantitative studies have adopted it (e.g., Kuan & Chau, 2001), which has often led to seemingly clean but overly simplified and potentially misleading results.

2.4 Challenges and Barriers

As such, we need much empirical effort on contextualizing or context theorizing studies, which some editorials that urge wider appreciation of and dedication to context-specific studies note (e.g., Bamberger, 2008; Howcroft, Newell, & Wagner, 2004). In line with Howcroft et al. (2004) who advocate for more context-aware theory building in IS research, Bamberger (2008) further suggests two challenging directions: 1) to shift from contextualizing to context theorizing research and 2) to eventually expand the range of context theorizing. To tackle such challenges will mean facing some major research barriers and involving fundamental changes in editors', reviewers', and even researchers' "mental models" (p. 844). The underlying barriers related to "the mental models" concern the research community's existing epistemological assumptions and practices that discourage, if not block, context-specific research. Those existing assumptions and practices insist "that new theories should be "consistent with what is already known and accepted"" and "that a theoretical contribution can only be made to the extent that the ideas presented are widely generalizable and offer broad-scale (i.e., not context-specific) applicability" (p. 843). Such challenges and barriers involving traditional "mental models" have also triggered various debates and dialogues in IS research over the years (e.g., Lee, 1999; Davenport & Markus, 1999).

2.5 Approaches and Suggestions

Given the aforementioned challenges and barriers, Tabak (2014) suggests that "emerging context-centered approaches move the position of context into the foreground of information studies" (p. 2223). Arnould, Price, and Moisio (2006) concur and advise researchers to properly select contexts for enriching theoretical insights. In line with their views, researchers have made various suggestions to help other researchers conduct context-specific research. For example, Berthon et al. (2002) suggest eight strategies that can help extend research horizon for information studies and require applying three research dimensions (i.e. theory, method, and context) differently. Four of the strategies specifically involve context: 1) the context-only extension strategy, which "takes an existing theory and method and applies it in a different context" (p. 423); 2) the method/context extension strategy, which "takes a new method and context, but employs an existing theory to explain the results" (p. 424); 3) the theory/context extension strategy, which "takes an existing method, but applies it to a new context and employs a new theory to explain the results" (p. 424); and 4) the pure generation strategy, which means that "a new theoretical framework is employed; a new methodology and a new phenomenological context are used" (p. 424). While the first two strategies relate to contextualizing research, the latter two resemble context theorizing research discussed previously. I summarize these suggestions in Table 3 with respect to overall, contextualizing, and context theorizing research.

Table 3. Summary of Approaches for Contextualizing and Context Theorizing Research

Approach	Guidelines	Sources
Overall	Move the position of context to the foreground.	Tabak (2014)
	Properly select contexts for enriching theoretical insights.	Arnould et al. (2006)
Contextualizing research	Situate studies in a context that mostly seeks to account for contextual conditions that will lead to contributions of theory.	Whetten (2009)
	Provide rich description. Show direct observation and analysis of contextual effects. Engage in comparative studies.	Rousseau & Fried (2001)
	Reconsider research design (e.g., cross-level/comparative research). Study processes. Investigate events. Collect qualitative data.	Johns (2006)
	Take an existing theory and method and apply it in a different context (context-only extension strategy). Take a new method and context but employ an existing theory to explain the results (method/context extension strategy).	Berthon et al. (2002)

Table 3. Summary of Approaches for Contextualizing and Context Theorizing Research

	Replicate theoretical models in different contexts.	Hong, Chan, Thong, Chasalow, & Dhillon (2013)
Context-theorizing research	Conduct studies of a context that will shed new light on how contexts affect research phenomenon.	Whetten (2009)
	Go beyond simply specifying situational and temporal constraints or boundary conditions. Illuminate how surrounding boundaries or temporal conditions directly influence research phenomena under investigation. Focus on how the relationships between research phenomena and those contextual factors might occur.	Bamberger (2008)
	Take an existing method, but apply it to a new context and employ a new theory to explain the results (theory/context extension strategy). Employ a new theoretical framework with a new methodology and a new phenomenological context (pure generation strategy).	Berthon et al. (2002)
	Treat contextual factors as antecedents of research outcomes (e.g. core constructs or dependent variables). Consider contextual factors as moderators of existing relationships Divide core constructs into contextual factors.	Hong et al. (2013)

3 Contexts and IT

In this section, I review empirical studies that may have contextual implications in IS research; my review, which I discuss next, agrees with Chiasson and Davidson's (2005) findings and lead one to conclude that contextualizing research (let alone context theorizing inquiries) in the IS field is scarce. To better overview these contextual factors, I aggregate them into greater contexts (i.e., organizational, industrial, and technological) in Table 4. One can make three key observations. First, despite these scholarly endeavors, we still have a relatively small number of empirical studies that specifically address contextual issues. In other words, while these empirical studies may have identified certain contextual factors, they have rarely focused on them. This observation echoes Chiasson and Davidson's (2005) viewpoints. Second, except for some studies that are related to technological issues, most studies focus on organizational (i.e., an organization's internal characteristics) and industrial contexts (i.e., external factors related to greater business environment or industrial landscape). Research has rarely found other factors concerning the global, national, social, cultural, political, or other contexts. Third, the studies share a propensity to examine the impacts of contextual factors on IT projects; we know little about how IT projects, in turn, reshape the local contexts (except Manning, 1996).

Table 4. Summary of Common Contextual Factors in the IT Literature

Contexts	Factors	Impacts on	Sources
Organizational context	Organizational culture	Interorganizational integration of IS and ERP assimilation.	Weber & Pliskin (1996), Kouki, Poulin, & Pellerin (2010)
	Organizational routines	Perception of technology, communication patterns, and work process and authority.	Manning (1996)
	Organizational structures	Perception of technology, communication patterns, and work process and authority.	Manning (1996)
	Strategic alignment	ERP assimilation.	Kouki et al. (2010)
	Decision environment	Information quality measurement.	Fehrenbacher & Helfert (2012)
	Centralization level	IT governance archetypes.	Xue et al. (2008)
Industrial context	Market nature	Success of production innovation and R&D projects.	Balachandra & Friar (1997)
	Environmental uncertainty	Business planning, IT alignment, and IT dependence.	Kearns & Lederer (2004)

Table 4. Summary of Common Contextual Factors in the IT Literature

	Information intensity	Business planning, and IT alignment, and IT dependence.	Kearns & Lederer (2004)
	Institutional pressures	ERP assimilation.	Kouki et al. (2010)
	Resource availability	Information quality measurement.	Fehrenbacher & Helfert (2012)
	External influence	IT governance archetypes.	Xue et al. (2008)
Technological context	Nature of innovation and technology	Success of production innovation and R&D projects.	Balachandra & Friar (1997)
	Types of ICT	Information quality measurement.	Fehrenbacher & Helfert (2012)
	Consultants' effectiveness	ERP assimilation.	Kouki et al. (2010)

4 Contexts and RFID

Similarly, in the RFID domain, existing studies tend to have underlying perceptions that one can transfer RFID's applications between contexts. Consequently, rarely have such studies examined contextual factors. Even when researchers conduct their empirical studies in a specific country that may, thus, have contextual implications, they have seldom situated their studies in developing countries or in the farming industry. To further illustrate these points, Appendix A summarizes RFID studies found that specify their research contexts (e.g., in a specific country and/or industry). I exclude numerous papers that are conceptual, technical, simulation, or modeling based. The table does not exhaustively list all existing RFID articles but present common examples that show a typical trend of RFID literature.

One can make several observations from my review. First, researchers still conduct most empirical RFID studies in developed countries. Among the twenty papers I reviewed, only three are situated in developing markets. However, those studies examine different issues than contextual factors. More specifically, Brown and Russell (2007) focus on factors affecting adoption intention rather than the actual adoption behavior of South African retailers. Kach and Borzabad (2011) and Nasir, Norman, Fauzi, and Azmi (2011) focus primarily on RFID's impacts on automobile manufacturing in Iran and on the Halal food-validation process in Malaysia, respectively. Second, RFID applications have seemingly reached a great variety of industries; logistics and retailing seem to be particularly prevalent. Among those few found in the farming or food industry, they all specifically investigate adoption factors or RFID impacts rather than contextual issues. Third, topic interests strongly favor RFID adoption factors or determinants and RFID impacts on various business processes and industries. Table 5 also reflects this observation in that the impacts of contextual factors examined often simply lead to RFID adoption in various industries. Fourth, despite high expectations about RFID's benefits, reported findings show low consistency. We still need to consider certain conditions before making conclusive results. For example, Loebbecke and Huyskens (2008) found that, despite positive results in improving efficiency, reducing costs, and saving human errors, item-level RFID needs to first resolve certain technological (e.g., equipment maintenance and reading accuracy) and privacy issues. Contradictory findings also show that organizational partners' pressure is positively associated with RFID adoption in Taiwan's logistics industry (Chang, Hung, Yen, & Chen, 2008) but not in the healthcare industry in the US (Lee & Shim, 2007).

In summary, few studies discuss factors that may relate to contextual issues, although most studies do not focus on such issues to begin with. To contrast to the discussion in Section 3 and summary in Table 4, I next briefly discuss those factors (see Table 5). I do not include studies that mention contextual factors but merely focus on adoption intention instead of actual RFID implementation (e.g., Tsai et al., 2010; Brown & Russell, 2007). First, in the defense technology industry in the USA, differences in organizational dynamics apparently influence how firms respond to mandated RFID (Barratt & Choi, 2007). Since the U.S. Department of Defense (DoD) contracts these organizations, one should expect their complete compliant to DoD's coercive RFID mandate. Thus, the contrasting institutional responses found to such powerful governmental pressures are intriguing.

Table 5. Summary of Common Contextual Factors in the RFID Literature

Contexts	Factors	Impacts on	Sources
Organizational context	Organizational dynamics	Responses to RFID mandates in the defense industry.	Barratt & Choi (2007)
	Cost burden (budget)	RFID adoption in logistics and livestock farming.	Chang et al. (2008), Hossain & Quaddus (2011)
	Strategy integration	RFID adoption in logistics.	Chang et al. (2008)
	Support for innovation/ managerial attitude	RFID adoption in logistics and livestock farming.	Hossain & Quaddus (2011)
	Quality of human capital	RFID adoption in logistics and livestock farming.	Hossain & Quaddus (2011), Lin (2009)
	Knowledge accumulation	RFID adoption in logistics.	Lin (2009)
	Organizational size	RFID adoption in logistics and livestock farming.	Hossain & Quaddus (2011), Lin (2009)
	Organization readiness/ facilitating condition	RFID adoption in livestock farming and RFID evaluation in supply chain.	Hossain & Quaddus (2011), Soon & Gutiérrez (2008)
	Performance gap	RFID adoption in healthcare.	Lee & Shim (2007)
Industrial context	Competitive pressures	RFID adoption in logistics and livestock farming.	Chang et al. (2008), Hossain & Quaddus (2011)
	Partners' pressures	RFID adoption in logistics, NOT in healthcare.	Chang et al. (2008); Lee & Shim (2007)
	Industrial environment/ environmental (market) uncertainty	RFID adoption in logistics and livestock farming.	Chang et al. (2008), Hossain & Quaddus (2011)
	External support	RFID adoption in livestock farming.	Hossain & Quaddus (2011)
Technological context	Partner dependence	RFID adoption in supply chain.	Soon & Gutiérrez (2008)
	RFID complexity	RFID adoption in logistics.	Chang et al. (2008)
	Mutual standard	RFID adoption in logistics and livestock farming.	Chang et al. (2008), Hossain & Quaddus (2011)
	Champion presence	RFID adoption in healthcare.	Lee & Shim (2007)
	Compatibility	RFID adoption in livestock farming and RFID evaluation in supply chain.	Hossain & Quaddus (2011), Soon & Gutiérrez (2008)
	Trialability	RFID adoption in livestock farming.	Hossain & Quaddus (2011)
	Perceived benefits	RFID adoption in healthcare.	Lee & Shim (2007)
	Technology readiness	RFID evaluation in supply chain.	Soon & Gutiérrez (2008)

Moreover, in Taiwan's logistics industry, Chang et al. (2008) show that three environmental factors (market's competitive pressures, supply chain partners' pressures, and industrial environment), two organizational factors (cost burden and integration of supply chain strategy), and two technology factors (RFID complexity and mutual standard) may influence companies' RFID adoptions. In the same national and industrial context, Lin (2009) suggests that organizational factors such as support for innovation, quality of human capital, knowledge accumulation, and organizational size also play significant roles in organizational adoptions of RFID. Since these two empirical studies are situated in the same context, their findings show complementary effects.

Further, in the U.S. healthcare industry, Lee and Shim (2007) found that the presence of IT champions, perceived benefits of RFID, organizations' performance gap, and market uncertainty were positively associated with RFID adoption, whereas vendor pressure was (surprisingly) not. Situated in New Zealand's various industries, Soon and Gutiérrez (2008) point out that technology compatibility and readiness and organizations' facilitating conditions are important to RFID evaluation, while dependence on partners is significant for RFID adoption. Lastly, in Australia's livestock farming industry, Hossain and

Quaddus (2011) conclude that various technological (i.e., complexity, compatibility, trialability, cost, and standards), organizational (i.e., farm size, human capital, managerial attitude, and organizational readiness), and environmental factors (i.e., external pressures, external support, and environmental uncertainty) may affect farms' decision to adopt RFID.

These contextual factors (see Table 5) show little resemblance to those in the IT literature (Table 4). However, similar to Table 4, one can categorize all the examined factors into three main contexts: organizational, industrial, and technological, which indicates that the existing technology-driven models such as the technology-organization-environment framework tend to dominate the IT/IS research community. As such, one cannot overemphasize our need to conduct more context-specific research.

5 Methodology

To theorize how RFID interacts with the researched local contexts, I conducted an ethnographic study over eighteen months. As a research methodology, ethnography is known for providing "thick description" and rich insights into complex social and cultural phenomena (Mattarelli, Bertolotti, & Macri, 2013). Such thick, rich descriptions seek to use participants' perspectives to illuminate the social norm and cultural practice taken for granted in the local context (Myers & Young, 1997). More specifically, a major essence that distinguishes ethnography from other qualitative research methodologies is its "centrality on culture" (Willis & Trondman, 2000). As I specifically situated this study in a culturally unique backdrop to shed light on how local contexts interact with RFID, I considered ethnography as rather suitable. In the IT literature, Orlikowski's (1991) work resembles a typical ethnographic study in the organizational settings. Although not specified, Barley's (1986) study also employs major ethnographic techniques. One can find other recent ethnographic studies in IS research in Schultze (2000), Crabtree, Nichols, O'Brien, Rouncefield, and Twidale (2000), Maier and Thalmann (2012), and Ravishankar et al. (2013).

5.1 Research Backdrop

In many aspects, this ethnographic study also followed the footsteps of these influential studies. My epistemological stance was similarly inductive and interpretive seeking to explore and make sense of how local contexts interact with emerging technology (i.e., RFID). Methodologically, my inquiry also relied on various ethnographic techniques: participant observations and lived experiences, informal social contact and conversations with participants, semi-structured interviews, and document reviews of background information.

Furthermore, while conventional ethnographers tend to follow a realistic or naturalistic approach that presents the research phenomenon "as it is", researchers have made recent attempts to encourage "a more reflexive style" (Beynon-Davies, 1997, p. 533). Such an emerging style "highlights the ethnographer's experience of doing fieldwork by giving a self-reflexive and self-revealing account of the research process" (Schultze, 2000, p. 8) and, in turn, "serves to sharpen the separation between the ethnographer and his representation of difference, thus achieving the effect that native worlds are authentically different from his (and our) own" (Marcus & Cushman, 1982, p. 48). In other words, self-reflexive style of ethnography, on the one hand, reveals an ethnographer's role in and relationships with the research context and, thus, renders the ethnographer's study to greater public scrutiny and critique, which, in turn, exposes and makes the ethnographer vulnerable (Schultze, 2000) but, on the other hand, "facilitates the expression of cultural differences" that can enhance the ethnography's authenticity and plausibility (Marcus & Cushman, 1982, p. 46). Incorporating the self-reflexive style of ethnography, I present self-reflection that details my role in and relationship with the research context in Section 5.2.

Although several years of work and lived experiences in the country shaped and reshaped my understanding of local contexts, I initiated the ethnographic study only after I received access to local farms and the primary participant organization, an agency that I here refer to with the pseudonym The Oasis Center (TOC) that belongs to one of local governments, which I refer here to as The Desert Paradise (TDP). I chose this organization because it was responsible for food-related issues and for initiating and implementing the RFID project. TOC comprised eight main divisions, one of which specifically concerned animal welfare. Although its business activities were mainly associated with local partners and suppliers, TOC has rapidly expanded its global network and collaborated with various international organizations.

My inquiry process began when the primary contact with whom I established prior professional collaborations and social relations introduced me to TOC's chief technology officer (CTO) who oversaw all

IT related projects for the company. The CTO then appointed a division manager who supervised RFID and related projects to assist with the study. Subsequently, I conducted unstructured conversations and semi-structured interviews with nine significant participants involved in the RFID project including project managers, RFID consultant and IT expert, veterinarians, the department head of animal identification, and local farm owners. All semi-structured interviews followed the same guideline and were digitally recorded and transcribed except for one for which I took intensive research notes instead. The duration of those formal interviews ranged from 60 to 118 minutes. In addition, I frequented clinics and local farms, including two typical small farms, one large private farm, and one commercial farm. Such longitudinal field work helped me experience local farmers' traditional farming and lifestyles and observe veterinarians' work practice and interactions with RFID systems. I summarize the details of my inquiry process in five phases in Figure 2; phase 5 repeated phases 3 and 4 and included reflecting on field work and previously collected data. Figures 3 and 4 further show how I learned to ride and milk a camel in the field, which were both part of local farmers' everyday life.

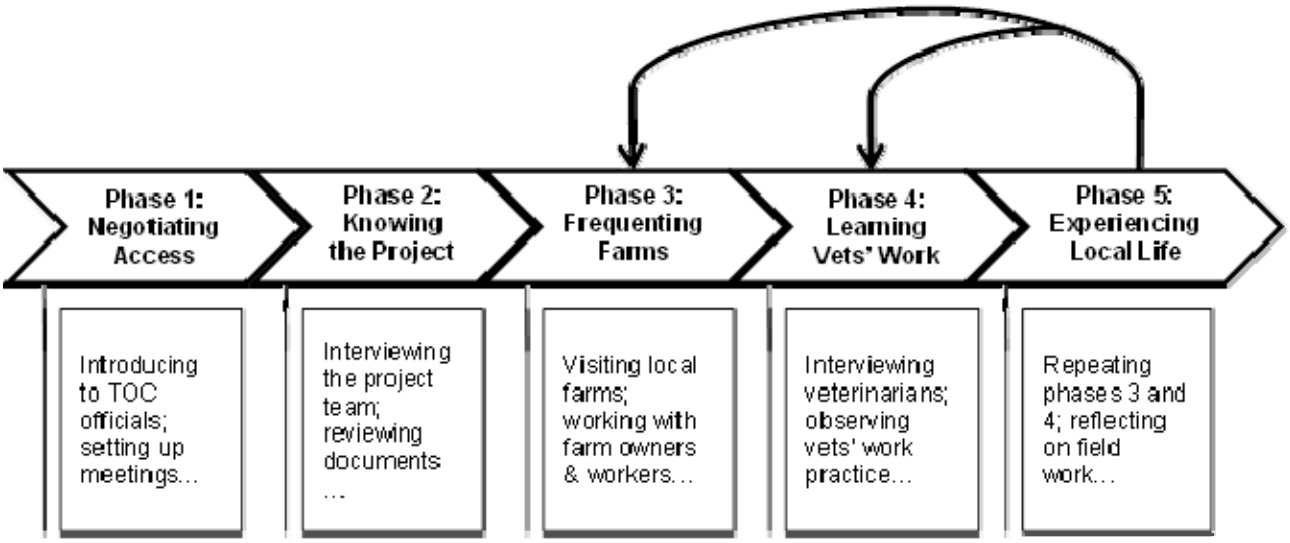

Figure 2. The Inquiry Process

Figure 3. Learning How to Milk a Camel

Figure 4. Learning How to Ride a Camel

5.2 Self-reflection

Even though I had previously studied the country's background, I still found cultural differences immediately surprising when I first relocated to the country. On the one hand, those cultural differences experienced often led to disbelief, discomfort, and frustration; on the other hand, they intrigued, fascinated, and enlightened. Ultimately, they all led to longitudinal adaption at work or in society in a way that helped enrich my professional and personal experiences. The natural environment of the country also required my longitudinal adjustment. When I first landed at the airport around midnight, the temperature was near 40 degrees Celsius. Although I was accustomed to a warm climate, the summer heat in the country at nearly 50 degrees Celsius fundamentally "attacked" my basic senses and challenged my everyday work and life. In society, I also often experienced contrasting personal or professional conduct in governmental or industrial organizations.

As these emerging cultural experiences continued to shape my understanding of the local context, I inevitably embedded them in the research process. For example, negotiating for research access in the country was not as straightforward as in my prior experience. It required not just formal authorization but, more importantly, personal connections. Through these personal connections, participants trusted my longitudinal observations in the field and social interactions (and interviews) with them. Their trust was particularly significant because gaining access was one thing, but facilitating them to tell or show me their stories was another. Without personal connections (and, subsequently, relational trust), it would be challenging to capture their authentic perspectives.

On a confessional note (Schultze, 2000), although I attempted to "blend in" with the natural research settings, my distinct features (see Figures 3 and 4) and professional relation with my primary contacts may have shaped how participants' viewed me. More specifically, because some of my earlier participants were my supervisees at school, their relatives and friends who joined the study might also have tended to view (and seemingly "respect") me not just as a researcher in the field but also a college professor at the same time. One event illustrates this situation well. In one of field trips, I got to witness a beauty camel that was worth over a million dollars (see Figure 5). While I gazed on the creature, a participant (student) repeatedly called me but received no response until he shouted out my first name, which was quite unusual for students to do. I did not pay attention to his calling in the first instance not only because I was appreciating the million dollar camel but because he addressed me as "Dr. so and so" as the students normally did in class. In the research setting, I tended to forget my professional role (as "Dr. so and so"), but the student (participant) apparently did not. Although we could not conclude to what extent these personal relations and professional roles affected the ethnographic inquiry, their effects on the research process were seemingly inevitable.

Figure 5. A Local Boy with a Beauty Camel

5.3 Holistic Analysis

My analytic approach to some extent followed the holistic ethnographic style of cultural anthropologists (Myers, 1999; Sanday, 1979), which focuses on deciphering contextual meanings embedded in the social, cultural, and political backdrops as a whole rather than simply relying on codifying techniques to generate patterns or categories. At its core, the approach focuses on obtaining overall understanding of a phenomenon. Specific patterns or categories of human or organizational actions that one identifies may help one understand a researched context; one needs to analyze these actions collectively so that one holistically interprets the research phenomenon (Sanday, 1979).

Such an approach is primarily based on the convention of realist ethnography that seeks to "facilitate the expression of cultural differences in a manner that makes them appear both authentic and plausible" (Marcus & Cushman, 1982, p. 46). Advancing Marcus and Cushman's framework, Golden-Biddle and Locke (1993) argue that one best achieves ethnographic convincingness through three dimensions: authenticity, plausibility and criticality. They further develop a specific guideline (see Table 6 for a summary) that systematically helps an ethnographer better analyze ethnographic texts.

Although other IS researchers have suggested other ethnographic guidelines (e.g., Beynon-Davies, 1997; Maier & Thalmann, 2012; Mattarelli et al., 2013), Golden-Biddle and Locke's (1993) framework is most suitable for my analytic purpose because it is a widely accepted one with most comprehensive criteria (Baskerville & Myers, 2015; Walsham & Sahay, 1999; Schultze, 2000). Following this guideline, I developed Table 6 to provide empirical examples that respond to each subdimension or criterion in Golden-Biddle and Locke's framework.

While Table 6 provides a holistic guideline for enhancing convincingness of my ethnographic work, Appendix B shows my documentary method (Crabtree et al. 2000) that links interview quotes or field notes to emerging concepts and contextual factors. This documentary method resembles "pattern modeling" (Beynon-Davies, 1997) that inductively categorizes field notes into concepts (Maier & Thalmann, 2012). Researchers such as Mattarelli et al. (2013) have also applied it to IS ethnographic research.

Table 6. Dimensions of Ethnography Convincingness (Golden-Biddle & Locke, 1993)

Major dimensions	Subdimensions	Examples in the study
Authenticity	Has the author been "there"—in the field?	
	Particularizing everyday life	• Various scenarios of cultural differences in everyday life and in the research process • Photos of everyday life
	Delineating the relationship in the field	• Self-reflection on my role in the field and relationships with participants (Section 5.2) • Photos of field work
	Has the author been genuine to the field experience?	
	Depicting the disciplined pursuit and analysis of data	• Linking field evidence to emerging categories and conceptual factors (Appendix B)
	Qualifying personal biases	• Confessional notes on my differences in cultural heritage and professional expectations (Section 5.2)
Plausibility	Does this make sense to me?	
	Normalizing unorthodox methodology	• Using tables and figures to systematically summarize and reconstruct the field experiences • Following academic practice to tell a holistic story (i.e., sequentially explaining methodology, research procedure, and analysis that lead to findings and implications)
	Drafting the reader	• Drawing attention to the RFID literature and highlighting knowledge gaps in various areas • Justifying the study's contributions in relation to RFID in the farming industry and in local contexts
	Legitimating the atypical	• Describing research backdrops and inquiry process that help make sense of the unique research context • Reflecting on personal experiences of cultural differences that help relate to common sense
	Smoothing the contestable	• Adopting existing frameworks (e.g., Golden-Biddle & Locke, 1993) to help make sense of field experiences • Extensive discussion on the interactive relationships between contextual factors and RFID implementation (e.g., Figures 12 and 13)
	Does it offer something distinctive?	
	Differentiating findings—a singular contribution	• Reflecting on the literature and knowledge gaps to highlight the study's contribution
	Building dramatic anticipation	• Casting doubt form the outset on whether RFID can be successfully implemented in the farming industry (Section 1) • Self-reflection on personal experiences of cultural shock helps build anticipation of cultural differences in the research process (Section 5.2)
Criticality	Does the text activate readers to re-examine assumptions underlying their work?	
	Carving out room to reflect	• Proposing various implications to help practitioners and researchers to reflect on their future managerial and research practice
	Provoking the recognition and examination of differences	• Suggesting different research scenarios that pave ways for examining contextual differences beyond the framework emerged here (e.g., the UAE vs. Argentina; the UAE vs. Malaysia) • Recommending policy makers to learn from other countries (e.g., France, Italy, Spain) that have experienced RFID impacts in a different context
	Imagining new possibilities	• Recognizing research limitations and, in turn, identifying future managerial or research possibilities that may go beyond the researched technology (RFID) or context (the UAE)

After completing my documentary method, I further focused on telling a holistic story "as it is" like traditional ethnographers do (Beynon-Davies, 1997), which means understanding the contextual factors from different dimensions such as when, who, why, where, what, and how (Maier & Thalmann, 2012). This process led to my developing Figures 12 and 13 that reflect my overall understanding of the researched phenomenon.

To ensure plausibility of my interpretation and storytelling, I separately consulted with two colleagues who were qualitative researchers but not involved in the study. I first discussed the research context and purpose. They then reviewed and verified the appropriateness of my interpretation. This process resulted in several changes and enhanced the consistency of contextual meanings I analyzed. In Section 6, my holistic analysis provides a necessary background to understand TOC's RFID project by narrating its project initiative and unique settings. I then focus on examining contextual issues that affect RFID implementation; this contextual analysis first narrates initial user resistance and then illustrates nine contextual factors that shaped TOC's RFID implementation. I further synthesize a deeper meaning of those factors in Section 8.

6 Stories of RFID Initiative

In contrast to many governmental agencies' mandatory actions, the RFID project at TOC was a voluntary initiative to develop better farming standards and food safety that would meet the global standards. When the study commenced, approximately 2.5 millions of animals were tagged with RFID chips. In addition to its own project team, TOC recruited a European RFID consulting firm, most specifically for its RFID experiences, to help carry out technical fieldwork. For one, TOC initiated this RFID strategy because the UAE heavily relies on food imports. From my lived experience in the country, I observed that it imported most common meat products (i.e., beef and lamb/mutton) mainly from Australia, Brazil, India, New Zealand, and Pakistan. While one of officials interviewed revealed that the country imported over 80 percent of its food products including livestock and meat from overseas, the World Bank's databank further confirmed his estimate (World Bank 2014). Another official also mentioned that the first factor for their RFID project was to follow the footsteps of advanced countries such as Canada and Australia that have integrated RFID into the food industry's supply chain systems.

However, only one of the UAE's seven emirates enacted such a proactive strategy. This RFID implementation's local scope indicated that the system was effective only in the emirate's territory and, thus, not yet integrated with the farming industry's supply chain infrastructure at the national level. Another unique backdrop of TOC's RFID project was that farmers under TOC's care received governmental subsidies to compensate most farming and RFID adoption costs. Such free-cost ownership led to their unique farming mentality. More specifically, because local farmers had little concern about cost, they were free to raise as many animals in the style as they wish. Nonetheless, with approximately 2.5 million animals tagged with RFID chips, the farming subsidy (which included covering RFID costs) had increasingly become a budgetary concern for TDP.

6.1 Backdrop Challenge

While TDP may have initiated RFID with clear strategic objectives, TOC faced a challenging process to implement it. Those issues first stemmed from users' passive resistance to emerging technology, which is a typical issue experienced in the IT-implementation process and not necessarily unique to the TOC's situation. More unique contextual factors that TOC needed to manage were actually rooted in the UAE's distinctive landscape, tradition, and religion that fundamentally shaped local residents' lifestyle and, in turn, their attitude and behaviors toward RFID. Furthermore, after RFID increasingly pervaded local residents' everyday life, the interaction between technology and various stakeholders involved in the RFID project further reshaped their existing farming practice and lifestyle. After I completed my ethnographic study, this interactive process between the local context, existing farming practice, and emerging technology (RFID) continued to evolve.

6.1.1 Users' Passive Resistance

One challenge that emerged quickly from the early RFID-implementation stage was users' resistance to unfamiliar emerging technology that required them to make many changes to their existing farming practices. For farmers or livestock owners, even though the RFID implementation cost them nothing and even though they received a livestock subsidy, they tended to avoid reporting and updating livestock

information that TOC constantly required. Failing to report livestock information generally denoted that 1) TOC would provide farmers with no subsidy and 2) farmers would avoid governmental intervention and continue their traditional farming style. Interestingly, some farmers/owners preferred the traditional farming style to the style they would have to adopt to obtain the subsidy. Indeed, the project team's field report verified that the number of livestock registered in the systems (i.e., requesting subsidy) was lower than actual number found in the field. My social contacts told one famous story that a farm owner would desperately claim that many of her goats were dead due to the RFID tags. Although her compliant was invalid, such an incident consistently supported project team's concerns about user resistance that they faced.

For veterinarians, RFID implementation required many changes in their clinical practice. For example, carrying traditional clinical packages to visit farms would no longer be sufficient. Additional accessories would also include personal digital assistants (PDAs) and RFID readers that would help them to record and update livestock information in the field. They would also need to learn various software and programs that assisted them to search, retrieve, update, or analyze livestock information. As those veterinarians were not technologically equipped to deliver clinical services with all those RFID-related devices, they and their practices inevitably had to bear a significant amount of extra work, including learning and training. Thus, one can understand their collective lack of enthusiasm for the technology. This situation led one official interviewed to assert: "Unfortunately, users resist changes. Doctors are afraid of new technology. But PDAs are necessary, readers are required, and software is needed. These are all new things to the doctors". Such passive resistance painted an overall picture of TOC's RFID implementation experiences from the outset. It also led an official to emphasize that "one of key things was to build a culture of using RFID…, to customize the cultural aspect of it..., [and] to raise culture among farm owners and urge them to relate RFID to TOC".

7 Emerging Local Factors

As the RFID project continued, TOC's project team came to realize that several unique backdrops led to challenging implementation experiences. While some of those factors often required customizing technical requirements, others would lead to reshaping the project team's understanding of TOC's RFID objectives, which somewhat differed from the team's prior experiences. These contextual differences also shaped the unique farming style of the country and led to unexpected implementation results. While I tell stories about each factor in the sections that follow, Appendix B summarizes examples of supporting empirical evidences to avoid excessive narrative in the paper's body.

7.1 About the Natural or Geographic Situation

7.1.1 Geographic Landscape

Although the consulting firm had successful RFID-implementation experiences in Europe and another Arab country, they did not foresee how the unique geographic landscape would shape the existing clinical practice, which, in turn, reshaped the project team's implementation endeavors. For millennia, the local residents maintained a borderless, tribal, and nomadic lifestyle. Even in contemporary urbanized environment, many of those tribal and nomadic activities such as camel riding and desert camping continued, which I personally observed and experienced. Situated in a vast desert landscape (see Figure 6), those activities often took place beyond communal, societal, or political boundaries. Over time, this borderless, nomadic mentality continued onto the country's farming businesses and veterinarian practices. Local farmers, clinics, and even TOC itself were not accustomed to establishing well-defined coverage areas for veterinarian services, which an interviewee illustrated (see Appendix B).

This local practice contradicted the existing systems requirements in which each clinic (and its veterinarians) only served and accounted for a specific area as "normally" implemented in Europe or other countries. Despite numerous meetings and continuous negotiation, the project team realized that simply applying their prior understanding and existing systems to the TOC's local setting would not be feasible. Consequently, they had to change the project's business scope and interfaces, redevelop clinical systems, and reeducate local farmers whose existing mentality was shaped by the country's unique geographic landscape and nomadic tradition.

Figure 6. A Typical View of the Country's Landscape

7.1.2 Livestock Nature (Camel)

TOC chose RFID to help manage its farming industry partially due to the unique nature of the country's traditional livestock, camels. While many individuals associate the camel with the Sahara or the Arabian Desert, it has various characteristics that, despite being a major part of human society and civilization in those regions for millennia, may require special handling. Although my personal experience with camels was pleasant and enjoyable over the years, I learned that their gentle gait can sometimes obscure their potential danger. For example, a project team member revealed that camels are very sensitive to human contact. When unfamiliar human faces approach, they can experience distress and react unexpectedly. Thus, TOC traditionally found it challenging to effectively examine camels closely. As such, the TOC's project team quickly embraced RFID's capability to transmit data without actual physical contact with the animal from the outset (see Appendix B).

Figure 7. Adapted RFID Tag (Beer Glass) for Camels

As the RFID project commenced, however, the project team soon realized that, unlike other livestock such as goats and cattle that the consulting firm had handled previously, camels' unique physical attributes and cultural value required the team to adopt customized RFID devices that were specifically designed for them. Typically, one tagged RFID chips in livestock's ears, which was not applicable for camels because, compared to their stature, camels' ears are disproportionally small. Most importantly, many camels held high commercial and cultural value in racing or beauty contests. During my field work in a commercial farm, I personally came in close contact with a black beauty camel that was worth over a million US dollars (see Figure 5). Thus, the camels' owners would not accept anyone's altering the camels' exterior features (see Appendix B). This specific requirement led the project team to seek an alternative solution that they nicknamed "beer glass". In contrast to regular plastic RFID chips tagged in livestock's ears, this special chip resembling a glass tube was injected into the camel's neck, hidden underneath its coat, and encapsulated by its tissues (see Figure 7). This technical modification exemplified how unique nature of local livestock shaped the course of RFID project.

7.2 About Project-related Issues

7.2.1 Managing Big Data

With millions of animals tagged with RFID chips, one interviewed official suggested that managing frequent data transmission and updates was "the most challenging thing to do". However, TOC and its project team expected this scenario. Their expectations also included tracking animal movement and managing their data changes accordingly. What they did not foresee or had never experienced previously was the frequency with which they needed to provide animal counts of each farm. Although the project team and TOC did not specify the reason for such a need, from my observations, I came to realize that the animal count was directly related to subsidy that each farm received. Also, due to various cultural practices that I discuss earlier (e.g., a lack of culture for farm owners to report animal data to TOC), the accuracy of animal counts in each farm also needed constant updates. As such, these unique requirements created unforeseen challenges with which the project team needed to cope (see Appendix B).

7.2.2 Managing Project Momentum

Conventional wisdom often suggests that the measures of project success primarily include four dimensions: quality, cost/budget, time/schedule, and scope/flexibility. More specifically, one might consider a project as successful if it was delivered with high quality, within budget, on time, and/or for the business scope that it set out to accomplish. For the TOC's case, cost or budget was not a critical concern due to the government's full sponsorship. The implementation schedule and system quality were the most important measurements of the project's success. In these aspects, TOC's project team, given limited manpower and tight schedule, launched the system satisfactorily. Despite certain detailed issues I mention above, TOC accomplished the project's initial objectives. The ongoing challenge concerned sustaining the current systems and improving the system's scope and quality for future management (i.e., "the momentum" as one interviewee stressed (see Appendix B)).

However, managing the momentum appeared more challenging than expected. Although the RFID project was officially completed when the consulting firm departed, at the time of writing, the systems were not yet been completely routinized. Due to many ongoing data changes, TOC needed to continuously adapt and modify the RFID system. Since the RFID experts departed, TOC, with limited experience and few IT experts, needed to face those ongoing issues alone. Various traditional mentality and cultural backdrops discussed previously further complicated the situation. Although TOC regarded the RFID project as a success when I completed my study, it remains uncertain how the project would continue its momentum due in part to political issues (see Section 7.4).

7.3 About Ways of Living

7.3.1 Traditional Lifestyle

One of the most unique backdrops that TOC's RFID project faced was the local farmers' traditional lifestyle that traced back millennia. The traditional lifestyle dictated how local residents lived with and raised livestock. More specifically, they did not maintain farms for commercial profits but for personal consumption and for traditions such as animal festivals, animal auctioning, beauty contests, and racing (see Appendix B). In line with such traditional lifestyle, nearly all local residents with whom I became

acquainted owned their own farms. In my field work, I observed that a small farm usually maintained approximately 80 to 100 goats (see Figure 8), along with other livestock, for personal consumption. A large farm that one could regard as a small family zoo could include a well-decorated house on site with many full-time workers and a variety of livestock such as ostrich, various types of cattle, goats and sheep, unique species of birds, among other animals.

Figure 8. A Typical View of a Small Personal Farm

From my personal experience, I learned to appreciate that the government was very sensitive and determined to maintain the region's long-lasting tradition that globalization and the West increasingly affected. I observed that TDP devoted much effort to various events and festivals that promoted the "traditional way of living". One example included a large number of giant paintings decorated on many street corners and pedestrian paths that depicted various traditional lifestyles (see Figure 9).

Figure 9. Portrait of Traditional Lifestyle in a Pedestrian Underpass

TDP's enormous sponsorship for the RFID project and subsidy program was also a consistent reflection on its endeavor to support the traditional lifestyle in the contemporary information age. The government's cultural dedication and endeavors naturally led it to assume all responsibility related to farming businesses and livestock activities so that the cultural aspect of lifestyle could continue, which one interview illustrated as follows:

> *The government has the responsibility to have the animal festivals, animal auctioning all the time. And that's why the government is responsible for festival related to beauty of the camels and also beauty of the sheep and goats as well.… So the government is keeping all that cultural aspect of life.*

This unique backdrop unsurprisingly led TOC's IT consultant to reflect that, when the project team first carried out the project, they had "to rollout [the project to] the entire local culture", which suggests that the team made significant efforts to convey new ideas, business processes, and changes that the RFID project would make.

7.3.2 Religious Customs

While the traditional lifestyle urged local residents to raise livestock as a hobby or for their festivals or personal consumption, religious belief further dictated that residents could slaughter the livestock only with a specific method. This method fundamentally differed from the electrifying one that slaughterhouses commonly practice. Consequently, local farmers tended to prefer slaughtering livestock by themselves as their ancestors had done so for centuries (see Appendix B). One of farm owners, Yousef, once described his experiences in a European country where he had to accompany his brother for long-term medical treatment. He revealed that, due to religious requirements, he could not purchase any meat products from regular supermarkets and, thus, faced difficulty in adjusting to foreign lifestyle for a long time. When Yousef could no longer bear the foreign diet, he eventually rented a vehicle, drove to the country side to search for local farms, and purchased livestock on his own. The local farm owner who Yousef described as a strong woman was efficient and friendly enough to further provide a slaughtering service. However, her slaughtering service followed E.U. regulations and did not comply with the traditional method to which Yousef was accustomed. Eventually, he convinced the farm owner to allow him to slaughter the animal by himself in his religious way.

This particular story shows how significantly the farming tradition in the UAE (possibly in all Arab or Islamic countries) embeds religion. In fact, many Arab males that I came to know were skilled in slaughtering animals as Yousef did. In an informal social gathering, a group of male students even vividly described the procedure. The vivid description instantly caused me discomfort, which, in turn, provided them amusement. To them, performing this type of tasks was a traditional part of their religious practice and a taken-for-granted norm strongly rooted in their society. Rarely would any of their societal members act differently from their normative expectations. Thus, they found it amusing to see my "unusual" reactions toward the "normal" task that religious rituals, festivities, and celebrations commonly involved.

For the TOC's RFID project, such religious practice contradicted the RFID initiative, which mainly sought to provide food safety throughout the industry's supply-chain networks including slaughterhouses and retailers. In other words, the RFID project sought to mandate fundamental changes in the existing farming practice. As the project team revealed, they would devote more time and effort to persuade local farmers and owners to relinquish their existing farming style that religious customs traditionally dictated. More specifically, even though the residents might understand the benefits of allowing certified slaughterhouses to process meat products, the electrifying method that slaughterhouses commonly used was not in line with their religious practice. Since the residents did not farm animals for commercial profit, TOC found it difficult to constantly monitor local farmers' daily farming activities (e.g., whether farm owners sent livestock to slaughterhouses). Thus, TOC's strategic intention to safeguard food safety had its challenges.

7.3.3 Urbanized Farming

During the RFID-implementation process, the project team further encountered various local factors that continued to influence their RFID endeavors: one related to the government's attempt to urbanize the traditional farming approach. Until recently, local residents typically maintained their farms next to residential areas. As a part of the RFID initiative driven by contemporary farming modernization, the government mandated all residential farms be relocated to certain remote districts specifically designated for farming purposes. Each of those designated districts aggregated numerous local farms in tightly

adjacent street blocks. A typical farm in those new establishments included a front gate, a farm cabin, and several fenced areas for different livestock such as camels, goats, cattle, and/or others. These designated districts quickly turned into farming villages (see Figure 10) away from city centers where most farm owners lived. To perform daily chores at the farms, the farms employed many expatriate workers from lesser-developed countries (see Figure 11). Their duties involved living on the farms and attending livestock all year round. The farm owners only visited the farms periodically. To the RFID project team, this emerging practice led to greater difficulty in obtaining registration data for the owners because, when they conducted field work, farm workers only knew the owner as the boss and could provide little useful information about them (see Appendix B).

Figure 10. A Typical View of Urban Farm Villages

Figure 11. Khalid Saddled up a Camel

Given such an urbanized farming style, the local farmers raised the livestock in close proximity. The government's generous subsidy program further allowed, if not encouraged, local farmers to raise as many animals as they could manage. Compared to farmers in EU or other advanced countries who typically focus on costs and profits, local farmers under TOC's care barely needed to pay attention to ensuring the animals were pure breeds. As a result, the project team witnessed many unusual mixed

breeds whose psychical features were not suitable for typical RFID ear tags, which resulted in more efforts from the project team to seek solutions that they could adapt to the local urbanized farming style.

> *Here, we usually have more animals than we have in Italy or Europe because that is, there is no focus on profits…. They don't focus on pure breed of animals…. For example, you have one breed of sheep to produce with another breed of sheep, and obviously offsprings are mixed. We also found strange breed of sheep that we don't know how it came out that it gets mix two common breeds and these sheep have almost no ears so their ears are either totally missing or so small that they cannot tag ear tag.*

Another unique characteristic of urbanized farming that further affected the RFID implementation concerned how veterinarians practiced. Unlike those in EU, Australia, or other advanced countries, TOC's veterinarian clinics belonged to the public authority. Local farmers would not need to pay for veterinarian services because they were a part of social welfare. Although I did not obtain a complete list of veterinarians in the country, those with whom I came to work were, coincidentally, expatriate professionals. The government's subsidy and social welfare programs seemingly led to unusual veterinarian practices that contrasted to those in EU and Australia. For example, in the EU or Australia and in a relationship that often positively correlates with service quality, private veterinarians gain income from their customers. To maintain proper care and service quality, the size of a veterinarian's customer base tends to reach its limit quickly in Australia or the EU. By contrast, TOC seemed to urge the clinics to serve as many customers (i.e., farmhouses) as possible, which meant veterinarians served more customers in the emirate than those in those advanced countries would typically serve. Given the UAE's unique desert landscape and traditional nomadic lifestyle, this situation inevitably created further challenges for the project team.

> *[In Europe] one veterinarian is following 20 to 30 customers and the customers are paying veterinarian…. Here, veterinarians of the public are paid by TOC that follow hundreds if not thousands of customers. So for now we identify animals, we are collecting the data, but we are not managing the movement like the system is supposed to be able to do, like it is done in Italy or in Australia.*

7.4 Societal or Political Concerns

7.4.1 Managing Federal Collaboration

In the emirate's border and/or jurisdiction, the RFID systems could manage millions of registered livestock inside as planned. However, the vaguely defined desert borderlines and traditional nomadic lifestyle meant that animals from other emirates or even neighboring countries could easily enter the emirate's territory. As those livestock from other emirates did not have RFID chips, TOC had no technological mechanism to trace or prevent any diseases or other issues from those "exterritorial" livestock. For example, according to a participant, a report noted that several hundred sheep from another emirate were infected with diseases. Thus, TOC perceived an urgent need to collaborate with other local governments to establish a national system so that it could identify, trace, and manage all livestock inside the country.

Although, accordingly to an official, "the first green light from upstairs" was granted when I concluded the study (see Appendix B), various political and technological challenges remained. First, all local governments needed to agree on the systems that TOC had implemented. If they failed to reach an agreement, highly political negotiations would ensue. It may take years before a federal RFID system could be implemented. Even if they agreed on the existing systems, federal laws would need to be legislated first. Other emirates may not provide generous subsidies and RFID sponsorships as TOC, which would further complicate federal collaborations. In addition, substantial marketing endeavors would be required to raise awareness and promote the use of RFID systems. Just as TOC and its project team experienced, one could expect that the emirates would face considerable challenges in implementing RFID at the national level.

7.4.2 Managing Social Sustainability

Beyond the existing and emerging technical and cultural challenges that the RFID team faced, ultimately, the TOC sought to sustain TDP's social sustainability. After I completed the study, I realized why TDP shouldered social responsibility and supported farming businesses for its tradition and culture. Although it may not have foreseen any financial returns on its investments, it did expect alternative results from, as

one participant mentioned, "the social stability within the people" and livestock owners' contribution to food security (see Appendix B).

If livestock owners could comply with the new policy and regulations in relation to RFID and food security, TDP could then gradually cultivate an emerging culture of contemporary farming style. Evidently, TOC provided generous subsidies and social welfare on the one hand but, on the other hand, sought to create a cultural environment that would help its citizens become more financially capable and independent so that the region could reach social sustainability. Although this expectation may require even greater endeavors unlike other technical and cultural challenges I discuss previously, TOC sought to achieve it with the RFID project (see Appendix B).

8 Discussion

To answer RQ1, I clustered nine factors that I analyze above into four major contexts: environmental, project, cultural, and societal/political (Figure 12). The environmental context specifically refers to the geographic and natural situation of the emirate. The project context mainly concerns project-related issues that occurred in the RFID implementation process. The cultural context addresses issues and factors primarily related to traditional and contemporary ways of living. The societal/political context reflects matters faced in the emirate's societal and political landscape.

To answer RQ2, I present RFID's interactions with local contexts in Figure 12, discuss them from Section 8.1 to Section 8.5, and summarize key findings in Figure 13. The analysis indicated that, while project, cultural, and societal/political contexts influenced the RFID implementation, the RFID project, in turn, reshaped those contexts. These interactive effects suggest that the relationships between these contexts and RFID implementation were complex, dynamic, and evolving. As Figure 12 shows, the arrow leading from the local contexts as a whole (i.e., the outer frame) to RFID implementation indicates that the local contexts affected the RFID implementation. The arrow that links RFID implementation to three connected contexts (i.e., project, cultural, and societal/political) indicates that RFID also affected the contexts. Figure 13 summarizes those contextual interactions. In addition, dashed arrows further depict inter-context relationships (see Section 8.5).

8.1 The Impacts of Environmental Context

Two unique factors that influenced RFID implementation in this context concerned the geographic landscape and livestock. First, anyone who has lived in the desert could relate to the vast, desolate landscape that one could hardly define with traditional civil or political boundaries (see Figure 6). For millennia, the UAE's environment has shaped its borderless, nomadic lifestyle. Despite the government's urbanization and technology endeavors, local farmers did not seem to concern about the clinical systems that TOC established. They continued to seek clinical services in their environmental proximity rather than in the administrative boundaries that TDP mapped. Their traditional behaviors eventually led to the project team's further adapting RFID systems so that the systems could better allocate veterinarian services and clinical resources.

Second, the emirate's livestock (i.e., its camels, mostly) shaped the RFID implementation. Physically and psychologically, these iconic creatures of the desert apparently required delicate handling. They also played a significant role in the country's camel racing and beauty contest industries that served influential purposes for its tradition, economy, and entertainment. Thus, local forms found traditional RFID mechanisms (e.g., typical plastic ear tags) that required exterior alteration unacceptable. This situation consequently led to the project team's alternative solution.

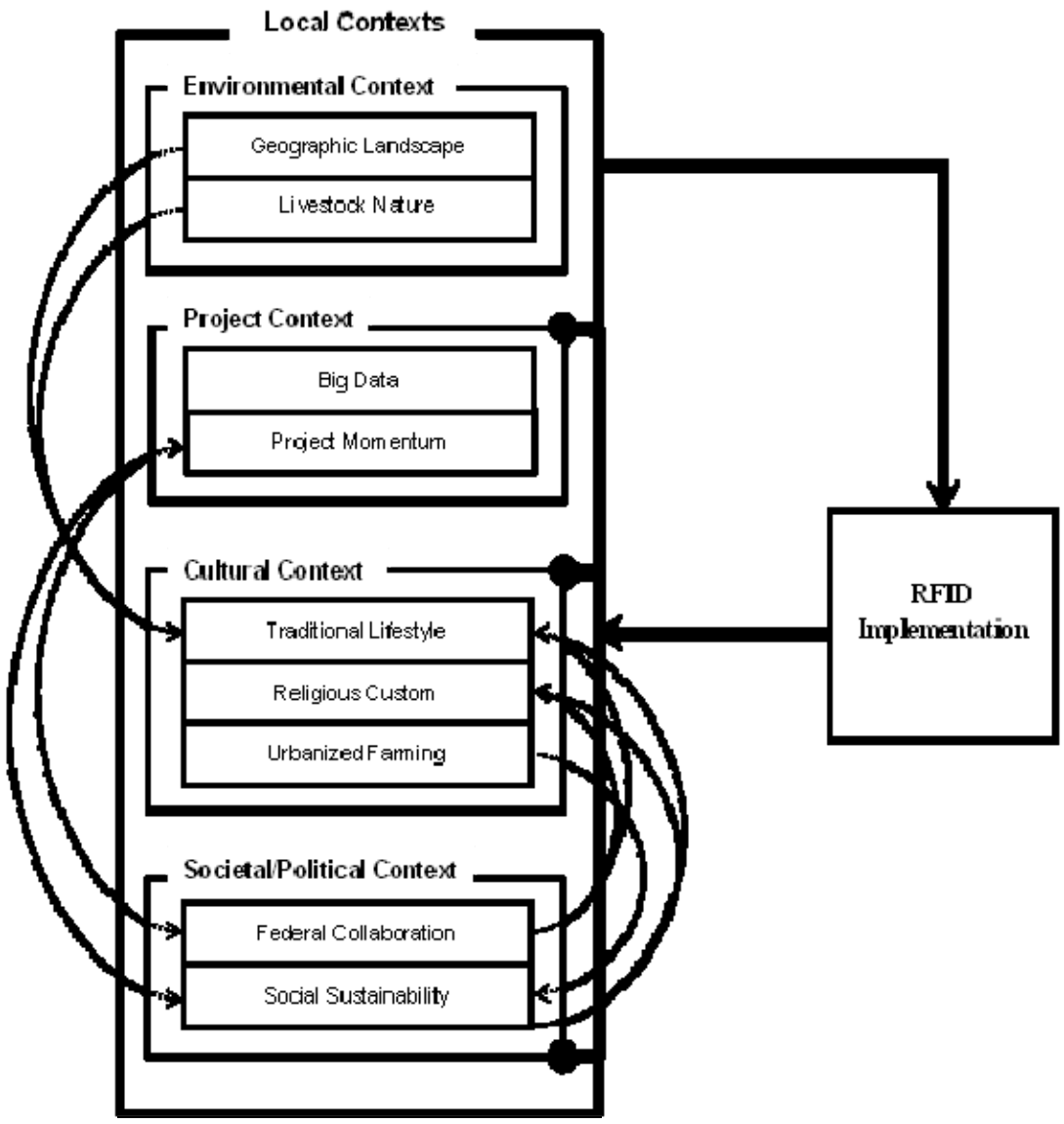

Figure 12. The Conceptual Framework of Contextual Effects on RFID Implementation

Contrasted to the IT or RFID literature where environmental factors' significant impacts on IT has been widely reported, this finding both differs and is similar to existing knowledge in different ways. The difference is that the existing literature's environmental factors often relate to the business environment or industrial settings, such as the notions of industrial standard (Brown & Russell, 2007) and environmental uncertainty (Kach & Borzabad, 2011). Research has rarely considered geographic landscape and livestock nature; as such, they can help extend existing notions of environmental context, which was the only local context I found that the RFID implementation did not shape. Thus, this finding may suggest that, when one cannot change contextual factors (e.g., livestock's physical characteristics and geographic landscape from which they originate) for RFID, the RFID implementation may need to adapt to them instead.

8.2 Interactive Effects of Project Context

In contrast to the RFID team's prior experiences, the TOC's project context demanded the team to tag millions of animals in an intense timeline. Such a project context, on the one hand, increased the team's intensive field work and, on the other, required the team to continuously adapt their prior experience to the

new situation. Consequently, two major issues about managing big data and project momentum emerged from the project context. More specifically, after completing RFID project, the team unexpectedly realized that TOC needed a way to frequently record the actual number of animals. This unforeseen scenario that particularly emphasize "animal counts" inevitably led to the team's adapting systems to better monitor and update the data TOC needed. Furthermore, from the outset, the project team concerned itself more with the project's time/schedule and quality rather than its budget/cost. Although the team delivered the systems on time with satisfactory functionality, the project did not simply come to an end. It continued to require changes to ensure the project maintained its momentum. In other words, while the project context affected the RFID implementation process, the RFID project, in turn, continued to reshape the systems and the project team involved.

Because the existing literature has commonly suggested that various factors of a project's context (e.g., the implementation team and the team's experience) influence project success (Finney & Corbett, 2007), I was not surprised to find that project context influenced the RFID implementation. However, unfortunately, the existing IT or RFID literature has rarely considered the project factors in managing big data and project momentum. Thus, one can consider these two factors as new constructs for future IT or RFID studies. Moreover, the findings also show not only that project factors influenced the RFID implementation, which was not surprising, but also that the latter reshaped the project context in return. Such interactive effects were unexpected and thus noteworthy.

8.3 Interactive Effects of Cultural Context

Three factors—traditional lifestyle, religious customs, and urbanized farming—shaped TOC's cultural context, which, in turn, affected the RFID implementation process. The UAE's traditional life dictated that local residents farm and raise livestock as a hobby rather than for commercial profits. This cultural factor explained why some local farmers were not completely enthusiastic about constantly reporting and updating livestock information to TOC. It led to the project team's tremendous efforts to educate local farmers and seek to "rollout [the project to] the entire culture". In turn, the RFID project increasingly reshaped the emirate's traditional lifestyle and evolved its farming business into a more technology-driven, healthcare-sensitive industry. Similarly, the UAE's religious customs also affected the RFID implementation in that local farmers who used to slaughter animals by themselves based on their religion's requirements tended to avoid the contemporary approach of slaughterhouses. Such practices threated TOC's ultimate objectives of accurate animal counts and food security. Further, because local farmers rarely managed farms for profits, they would continue to rely on the government's subsidies and social welfare. Consequently, TOC actively developed various programs that would urge local farmers to follow contemporary slaughtering approaches and to channel farming activities into commercial markets. These endeavors would then inevitably reshape local farmers' customary practices. Lastly, the UAE's contemporary urbanization rapidly led to new establishments of farming villages that separated farm management from ownership. For the RFID implementation, this emergent situation created greater barriers in collecting farm owners' registration information and, subsequently, imposed more field work onto the project team. In addition, with the government's subsidy program and traditional mentality, local farmers tended to maintain more animals than what one would expect of a farm with a similar size in other places such as the EU or Australia. This emerging urbanized farming style inevitably imposed on clinical services and resources. After completing the RFID project, TOC was inclined to systemically monitor existing farm management and livestock medical records so that food security in the emirate would meet the global standard. Their persistent efforts led to the results that RFID did not just help enable the contemporary living but also increasingly transform it.

As cross-cultural IT researchers have long advocated the significance of understanding cultural impacts on the globalized IT environment (Weisinger & Trauth, 2002), the finding of cultural context's interactions with the RFID implementation reinforces their position. Conceptually, my finding that cultural factors can influence RFID implementations reiterates the significance of cultural factors in the IT environment. However, the existing cross-cultural IT literature tends to focus on organizational culture or simply comparing national differences (e.g., Walsham, 2002; Davison, Kien, & Ying, 2008). Rarely have empirical investigations included social and cultural notions such as traditional lifestyle, religious customs, or urbanized farming. Moreover, the finding that RFID can reshape cultural contexts suggests that, while the technology itself might be a lifeless product, its interactions with users are not. They continue to evolve as users' behaviors and their cultural context continuously change. Thus, this interactive process is evidently more dynamic than previously understood.

8.4 Interactive Effects of Societal/Political Context

Even though TOC has a clear, proactive strategy for its RFID initiative, its political milieu could only permit a local system at the time of study. Maintaining this local system, even after it was successfully implemented, meant that the country's vaguely defined political boundary would create enormous challenges. As such, federal collaboration to implement RFID nationwide would logically be the subsequent step. Since TOC's RFID project was the first and only system in the country, it could potentially influence future political negotiation among local governments. In other words, while the political backdrop seemed to shape TOC's RFID initiative, its successful implementation may, in turn, reshape the UAE's political context in relation to the federal system for the whole country. In addition, TOC and TDP ultimately envisioned greater social sustainability that could fundamentally transform the region's existing farming and food industry. While this vision might have intertwined with many healthcare concerns and cultural backdrops discussed previously, it evidently influenced how TOC carried out its RFID project. The government eventually realized that, although it might not gain economic returns from investing in its RFID project, achieving social sustainability in the long term could be an invaluable reward. More specifically, TOC and TDP have increasingly sought to use RFID's capabilities to help transform the region's farming industry so that its farmers would be more financially independent from the government's subsidies and social welfare. Thus, the RFID project might have reshaped the emirate's societal context.

Reflecting on the existing literature, I argue that this finding is particularly insightful for two reasons. First, the notions of social sustainability and federal collaboration are unique to my researched context and rarely found in the existing social and political studies on IT implementations. The traditional social and political notions in IT environments often refer to social interactions/relations and organizational politics at the individual or organizational levels (e.g., Anderson & Jay, 1985; Angst, Agarwal, Sambamurthy, & Kelley, 2010) rather than national or societal levels as found in the current study. Second, the existing body of knowledge tends to examine the impacts of social and political factors on IT implementations (e.g., Markus, 1983). We do not adequately know how the latter reshapes the societal/political context in turn. As such, my findings may help contribute to future social and politics research in IT environments.

8.5 Emerging Contextual Interactions

In addition to the relationships between four contexts (i.e., environmental, project, cultural, and societal/political) and RFID implementation, my findings further depict emerging interactions between certain contextual factors. First, geographic landscape and the specific livestock contributed to the local residents' traditional nomadic lifestyle. If not for the borderless desert landscape and camels' characteristics that naturally fit the environment, the local residents might not have cultivated the nomadic lifestyle. Second, given the successful RFID experiences in the region, the growing project momentum further urged social sustainability programs and federal collaboration for a national RFID system. If TDP fully realized social sustainability and federal collaboration, they can subsequently strengthen TOC's RFID project's momentum. The dual arrowheads between project momentum and social/political context in Figure 13 depict this interactive relationship. Third, urbanized farming style has increasingly facilitated TDP's intention for social sustainability. Consequently, TOC has developed programs to start mandating residents (farm owners) to comply with new regulations and policy that would meet international standards for the farming industry. TDP's strategic movement toward social sustainability means that local residents can no longer practice some traditional ways of living (e.g., traditional slaughtering of livestock products). Similarly, federal collaboration will potentially expand TOC's RFID experiences to all emirates in the UAE and, in turn, influence local residents' traditional lifestyle and religious customs. The dashed lines in Figure 13 represent all these inter-context relationships, and the arrowheads show the influence direction.

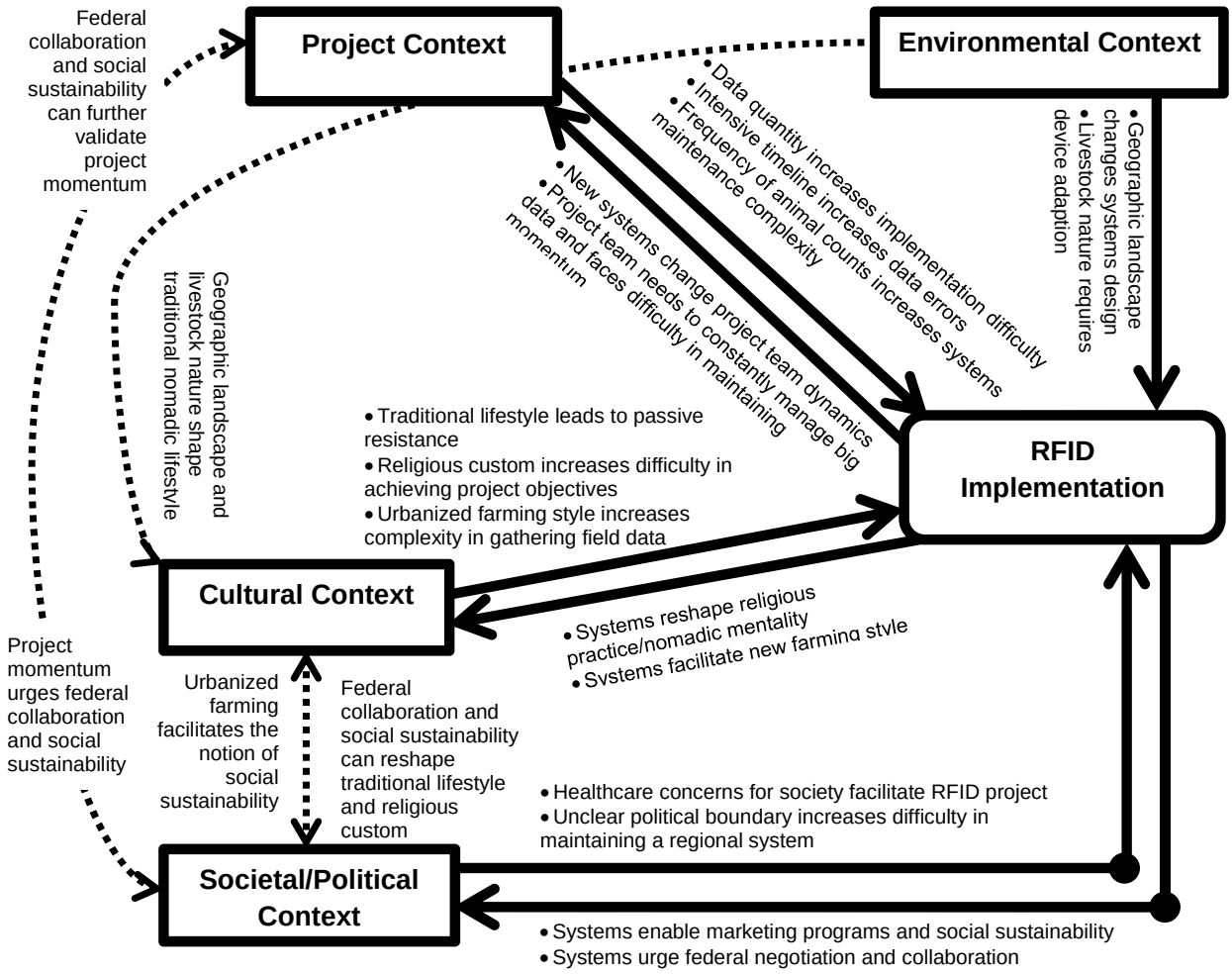

Figure 12. The Interactive Relationships between Contexts and RFID Implementation

Compared to Tables 4 and 5, my findings and conceptual framework (Figure 12) reiterate the notion of contextual significance in IT implementations in general and RFID projects in particular. They further show that significant local factors that emerged from the research context vary considerably. More specifically, local factors that influenced RFID's implementation in the emirate specifically pertain to its unique backdrop. While the existing literature tends to focus on organizational, industrial, and technological issues, my findings disclose other significant factors in the emirate's natural environment and cultural, societal and political contexts that empirical research has rarely examined. Furthermore, the interactive effects between project, cultural, and societal/political contexts and RFID implementation indicate the dynamic, complex nature of emerging technology in a local context.

9 Implications

For practitioners, I suggest that, prior to any RFID project, one needs to thoroughly understand the local context. Even if the project team has had successful implementation experiences with similar RFID technology in an advanced region such as the EU, one should not assume that one can apply such experiences to the local context without carefully evaluating the technology's suitability to the adopting country's specific needs. In addition, once one receives sanctioning for a project, one needs to develop a detailed plan to examine and respond to local contexts to comfortably implement RFID. While technological functionalities might be able to address certain concerns universally, the local context's environmental, project, cultural, and/or societal/political factors may require managerial or technological adaption to meet unique systems requirement, which will, in turn, allow one to more smoothly implement the project.

In this regard, I recommend that any organization or project team that wishes to conduct businesses or RFID projects in a new, local context first seek expertise or local partners who have experience in dealing with that environment's specific needs. To better deal with emerging technology (for which many have little expertise), IT managers can consider participating in professional associations and institutional networks where they can gather local business intelligence. For UAE in particular, business intelligence should help IT managers prioritize contextual factors that may affect future projects. In addition to organizational, industrial, and technological factors discussed in the existing literature, IT managers may need to further inquire what environmental, project, cultural, and societal/political factors will directly influence the project-implementation process and, in turn, develop alternative responses accordingly. For example, the UAE is a culturally and religiously sensitive society. Its citizens have taken their traditional lifestyle and religious customs for granted for centuries. Any business activities and RFID projects that will interfere with the taken-for-granted lifestyle and religious practice may result in local resistance, incur intangible costs, and, thus, need to change. Also note that the UAE comprises seven emirates. Even though the UAE has a federal government, local authorities and monarchies govern each emirate. Potential collaborations with local authorities and the federal government would not necessarily follow the same procedures or regulations. Thus, any organization that seeks to enter this market will require knowledge about these issues.

For policy makers, my conceptual framework suggests that, because RFID implementation can reshape local contexts (particularly in relation to cultural, societal, and political factors), these contexts' authority and policy makers will need to be aware of these potential changes (or, indeed, those from other emerging technologies) and carefully evaluate whether those changes match their future vision for the country. In TOC's case, RFID implementation has increasingly reshaped the traditional lifestyle to which local residents have been accustomed for centuries. Therefore, local governments and policy makers need to seek a fine balance between embracing the contemporary urbanization and globalization, advancing to the list of developed nations, and maintaining traditional lifestyles and cultural practices. Indeed, many rapidly emerging nations such as Kuwait, Saudi Arabia, and Qatar, and others that share similar cultural and/or religious backdrops such as Brunei and Malaysia experience this situation. Many developed countries have also long ago implemented RFID and, thus, faced a similar situation previously; some, nonetheless, continued to maintain a rich cultural heritage. As such, I recommend that local authorities and policy makers in the UAE or in similar social and cultural contexts consider collaborating with culturally rich, advanced nations (e.g., France, Italy, and Spain) and learn from their prior experiences in dealing with RFID that may have reshaped their local industries and societies.

For researchers, the insights gained from my conceptual framework offer several theoretical implications. Overall, researchers should more strongly recognize and appreciate the essentiality of local contexts in the RFID implementation process. Researchers need to reconsider the common research practice that applies an existing technology model to different industrial or cultural settings. We need more empirical endeavors that extend cross-cultural IT research and help better explain the meaning and practice of RFID in different local contexts. For example, since I situated my ethnographic study in the UAE's farming industry, future studies could consider investigating RFID implementation in the same industry in comparable (e.g., Qatar) or contrasting developing nations (e.g., Argentina). One could then contrast and potentially extend the insights gained from such comparative studies with the underlying arguments of my framework.

Second, specific contexts analyzed in my ethnographic study also extend the existing IT and RFID implementation literature. More specifically, new notions emerged from those contexts are beyond typical organizational, industrial, and technological factors discussed in Sections 3 and 4. They can be related to various reference disciplines other than business and IT, which, in turn, could pave ways for future studies. For example, future researchers may find insightful theories in the disciplines of sociology, urban studies, anthropology, and/or religious and cultural studies to help investigate how to manage local cultural factors (e.g., traditional lifestyle, religious custom, and urbanized farming) in the IT or RFID implementation process. It is thus reasonable to expect more research opportunities that are potentially based on interdisciplinary theories.

Third, existing studies have rarely found or examined the interactions between RFID implementation and project, cultural, and societal/political factors. Those interactive effects show how RFID or emerging technologies in general might reshape local contexts in which they exist. In addition, the various inter-contextual relationships I found can also pave ways for future research opportunities. As Figure 12 and Figure 13 in particular show, those relations illuminate not just what context factors interact with research

phenomena but also how they occur. These insights can help context-theorizing research in the RFID or emerging technology domains. Because context researchers suggest that comparative studies are often an ultimate approach to generating widely applicable context theories (Rousseau & Fried 2001), one can propose various research venues for future research. For example, future studies could consider comparing RFID in different contexts (e.g., how RFID implementation interacts with local contexts in the farming industry in Qatar vs. Malaysia) or different technologies in the same or across different contexts (e.g., how the UAE (or Kenya) farming industry implements business intelligence or big data analytic systems).

10 Limitations and Concluding Remarks

While my ethnographic inquiry offers various managerial and theoretical insights, it still has several limitations. Epistemologically subjective, an ethnographic study cannot draw generalizable conclusion as most quantitative studies do. In addition, I situated my study in one specific Arab country. As such, when interpreting my results, one needs to take the context into consideration. Several of my colleagues have also suggested that one needs to use a theoretical lens to guide a qualitative study. We might consider the fact that my ethnographic study does not draw on a specific theoretical model beforehand as drawback and strength at the same time. On the one hand, without an existing theory's guidance, my ethnographic study could result in lacking of focus and structure. On the other hand, without drawing on a predetermined theoretical model, it is more in line with traditional ethnographies (e.g., Malinowski, 1920, 1925) that are explorative in nature, and more consistent with the focal point of my study that argues for the essentiality of local contexts to the IT studies, which existing models that generally assume universally applicable concepts should not dictate. Further, due to access issues, I could not examine other stakeholders (i.e., slaughterhouses and retailers). Although these stakeholders relate more to commercial aspects of the farming industry, which I did not focus on in this study, including their perspectives would have drawn a more complete picture since they are, after all, a part of the industry's supply chain networks. As such, future studies could consider remedying these drawbacks by adopting different methodologies and/or extending their investigation scope.

In retrospect, I can make several concluding remarks about the conceptual framework. First, local contexts simply count. Future researchers should reconsider the common research practice, which epistemologically assumes that one can apply an existing popular model to different situational or temporal conditions. Second, contexts that matter are likely to vary across research phenomena and settings. Those that emerged from context I studied may differ considerably from those related to consumer behavior on social media in an African country's retailing industry. Third, specific factors or constructs emerged might also vary across research contexts. Fourth, contexts are not static conditions or constructs but most likely evolving situations that continuously interact with research phenomena. Thus, future managerial practice or research endeavors needs to focus on better appreciating the process rather than just the factors through which those interactions occur.

Lastly, as RFID continues to transform many industries worldwide, we can expect its practical and research implications in the future. Nonetheless, the research community and industry have not yet convincingly showed how local contexts shape, or are reshaped by, RFID implementations. As such, my ethnographic insights and conceptual framework can potentially pave ways for future research investigations on the topic. Finally, because RFID implementations may interact with the local contexts in an unexpected way, which may further lead to its reshaping traditional lifestyle, religious practices, among other aspects of work and life, I urge policy makers to fully recognize the changes that RFID may bring into local contexts and to develop and incorporate a responsive plan into their RFID strategy so that the local community may enjoy technological benefits on the one hand and maintain its traditional lifestyle on the other.

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Appendix A

Table A1. Examples of RFID Studies with Contextual Implications

Studies	Topics	National contexts	Industrial contexts	Major findings
Bardaki, Kourouthanassis, & Pramatari (2010)	Retail promotions management	Greece	Retail	• Properly adopting RFID can contribute promisingly to retailing strategy. • One needs to resolve stakeholders' different perspectives and cost benefit justification, among other issues.
Barratt & Choi (2007)	Mandated RFID and institutional responses	USA	Defense technology	• Different organizational units in the same corporation respond to mandated RFID differently depending on their internal dynamics.
Bendavid, Lefebvre, Lefebvre, & Fosso-Wamba, (2009)	Supply chain KPI evaluation	Not specified	Utility	• RFID can provide data to utility applications and help integrate B2B e-commerce. • RFID's impacts on supply chain's KPI depend on various organizational and technical contingences .
Brown & Russell (2007)	Factors affecting RFID adoption	South Africa	Retail	• At the time of study, most retailers have not adopted RFID in South Africa. • Factors affecting their RFID consideration include technological, organizational, and external issues.
Chang et al. (2008)	The determinants of RFID adoption	Taiwan	Logistics	• Market competition, partner pressure, industrial environment, cost, supply chain integration, and RFID complexity and mutual standard are major adoption factors.
Dwivedi, Kapoor, Williams, & Williams (2013)	Factors affecting RFID use and satisfaction	UK	Library	• RFID's systems quality and information quality affect systems use and library user satisfaction. • RFID system use is positively associated with library user satisfaction.
Ha, Song, Chung, Lee, & Park, (2014)	Effects of RFID in supply chain	South Korea	Food and beverage	• Introducing RFID into major operational areas in the food/beverage industry (i.e., procurement, production, transport, sale, warehousing, and administration) shows positive effects on supply chain activities.
Hossain & Quaddus (2011)	RFID adoption and continued usage intention	Australia	Livestock	• RFID adoption depends largely on various technological, organizational, and environmental factors and users' expectation and self-efficacy. • Continued intention of RFID depends on satisfaction of current usage and self-efficacy.
Janz et al. (2005)	RFID in healthcare	USA	Healthcare	• RFID can assist in measuring and controlling workflow processes. • Successful RFID implementation requires traditional and non-traditional IS practices. • One can learn various lessons from RFID in the healthcare context; some about business processes and some about data management.
Kach & Borzabad (2011)	RFID on manufacturing efficiency	Iran	Automobile	• RFID appears to significantly improve efficiency in warehouse and with supplier partnership. • Environmental uncertainty might inhibit RFID's wider adoption.
Lee & Shim (2007)	RFID adoption in healthcare	USA	Healthcare	• IT champion, performance gap, market uncertainty, and perceived benefits lead to adoption, while vendor pressure does not.

Table A1. Examples of RFID Studies with Contextual Implications

Lin (2009)	Determinants of RFID adoption	Taiwan	Logistics	• An organization's support for innovation, its quality of human capital, knowledge accumulation, and size all seem to positively associate with the adoption of RFID.
Loebbecke & Huyskens (2008)	RFID in the Japanese publishing industry	Japan	Publishing	• While the trial results show that RFID improve efficiency, reduce cost, and save human errors, several issues can be further improved such as equipment maintenance and the speed and accuracy of RFID reading. • Although item-level RFID improve innovative marketing, privacy issues might need to be properly addressed.
Nasir et al. (2011)	RFID on validating Halal food	Malaysia	Food retailing	• RFID seems to be effectively replacing the traditional validation systems for Halal food. Consumers are satisfied with RFID's usability, efficiency, security, affordability, and profitability.
Ngai et al. (2007)	Critical success factors of RFID's traceability systems	Hong Kong (China)	Aircraft engineering	• Internal and external motivation, aspiration to global competiveness, interorganizational implementation, the minimization of process changes, small RFID scope, the facilitation of vendor's investment, reusable tags, and the transferring of academic knowledge are eight critical success factors.
Soon & Gutiérrez (2008)	RFID adoption in supply chain	New Zealand	Supply chain (various industries)	• Technology compatibility, readiness, and facilitating conditions are significant factors for evaluating RFID. • Dependence on trading partners is significant for RFID adoption.
Tsai et al. (2010)	Determinants of RFID adoption intention	Taiwan	Retail	• Relative advantage, supply chain integration, and organizational readiness positively associate with RFID adoption intention. • Complexity negatively associates with RFID adoption intention.
Uhrich et al. (2008)	RFID in CRM	Germany	Retailing	• RFID can help relationship marketing of the retailing industry in recruiting, retaining, and recovering customers. • Significant applications of RFID could serve as "one face to the customer", "information terminals", "interactive advertisement displays", "individual pricing", "value-added services", and "recommendation systems".
Wamba & Chatfield (2011)	RFID on warehouse process innovation	Canada	Logistics	• RFID improves warehouse supply chain processes. • Suppliers are reluctant to adopt RFID due to initial implementation cost which, in turn, minimizes realized benefits. • Network externality is essential to maximize the benefits of RFID. • Organizational factors are significant issues for a RFID project.
Whitaker, Mithas, & Krishnan (2007)	RFID deployment and return expectations	USA	Not specified	• Firms with wider IT application deployment are more likely to adopt RFID. • Firms with higher RFID spending and partners' mandate tend to expect early return, while inadequate industrial standard links to firms' expectations of delayed return.

Appendix B

Table B1. Linking Field Evidence to Emerging Categories and Conceptual Factors

Conceptual factors	Emerging categories	Examples of interview quotes or field notes (bold my emphasis)
Environmental context	Geographic landscape	*TOC has 28 veterinarian clinics but they did not have, still don't have a very clear **border**…because the **border** was not defined. So one thing we did in the end was both clinics to draw a **map** of their **border** and we create a **map**…. We use **GPS** coordinators to assign them to clinics.*
	Livestock nature (camel)	*Now the animals are not **kind**…. So coming very closely to the animal could be **dangerous** as expected…. But that's another aspect before the special dealing with camels…. So you need some sort of tool or mechanism to be able to read the identification of the animal without getting too closely.* *Or camels, since they have **small ears**, and because the tagging to be adding on the camels, especially here camels are entered for beauty contests, or price of racing camels can be millions of dollars, … they **don't want ear tags on camels**.*
Project context	Managing big data	*Now I think we have **3 million** tags stored in the **database** including the old ones…. Right now the system is coping well with the **quantity of data**, the only problem that I am having is that the system is designed to manage the animal movement not animal count so if I need to tell you how many animals in each farm in TOC I need to **count all the animals**. This has become quite a lot, because **numbers of farms**, and **numbers of animals** are increasing…. The problem is **counting animals** is something that is quite often.*
	Managing project momentum	*Our biggest challenge is not to lose the **momentum** that we have created. But…millions of animals…. They are moving, they are dying…. And that is what TOC's biggest challenge. It's not to lose the **momentum**.*
Cultural context	Traditional lifestyle	*The main difference between here and Europe is that animal farmers here are not in the business for the money, they are raising the animals mainly for **tradition** because it is **traditional** here to keep animals.* *As far as the wild animals are concerned, it saves the **nature of the UAE**. As a lot of livestock owners they keep them as a **hobby**. They don't use them for commercial aspects. They use it for a **hobby** or **personal use**, sometimes **racing for beauty**.*
	Religious custom	*There are many **religious** events…supposed to slaughter animals. And even if there has been a push to have those animals slaughtered at the proper slaughterhouse, people not thought about it as it should be done, according to **Holy Quran**. So they prefer to slaughter the animals by themselves. This also means that they are not managing farms for maximum profits like they are in Europe or in the USA or in Australia.*
	Urbanized farming	*So for example they [owners] almost **never live on the farm**, they have **workers to live on the farm**, hired to keep manage the animals, and owners usually visit the farm once a week…. We went to most farms…. The problem is that…they **did not even know the names of owners** of the farm. For them the owner is the aba (boss). And that is it…. "What is his name?" "We don't know" so we have very hard time trying to get good data from these people. This is something we did not foresee. We already know that it will be difficult to get data on the farm, on the owners while also tagging animals. This is even more difficult because most of time we did not even get to meet the real owner of the farm.*
Societal/political context	Managing federal collaboration	• "The first green light from upstairs" has been granted. • All state governments would need to agree on the systems that TOC has implemented. • Federal laws would need to be legislated first. • Substantial marketing endeavors will be required to raise awareness and promote the use of RFID systems.

Table B1. Linking Field Evidence to Emerging Categories and Conceptual Factors

	Managing social sustainability	*The government says 'Fine I would support the livestock owners but I expect some returns as well' as it is not necessarily financially but yet has the **social stability within the people**.* *I think the importance is to allow that **culture to develop itself** until we reach the **sustainability**…. And we believe that if there are sufficient incomes to the livestock owners, **depending on the government** would be lessened.*

About the Authors

Wenshin Chen is currently senior lecturer of business analysis and information management at Newcastle Business School, Northumbria University. He received his PhD from International Graduate School of Business, University of South Australia, and EdD from University of Houston. His primary research interests include social perspectives of information management, strategic management of information technology, healthcare information technology, and green issues of information management among other emerging IT topics. Some of his research work can be seen in *Information Systems Journal, International Journal of Information Management,* among other international journals and conference proceedings.